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Open File Report - 29

Characterization of the sediments overlying the Floridan aquifer system in Alachua County, Florida

by

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INTRODUCTION AND BACKGROUND

The Water Quality Assurance Act of 1983 mandated the establishment of an Ambient Ground Water Quality Network to aid in the prediction and detection of contamination of Florida's ground water resources. Administered through the Florida Department of Environmental Regulation, this legislation provides the funding for constructing a background ground water quality well network statewide. Also included within the scope of the Act are research provisions for defining aquifer systems based on new and existing hydrogeologic data, water quality sampling and analysis, as well as in-depth studies ranking the hydrogeologic pollution potential of the aquifer system. The bulk of the hydrogeologic data acquisition, compilation, and analysis work is currently being undertaken by the five water management districts and, in Alachua County, by the Alachua County Department of Environmental Services (ACDES).

As an integral part of its on-going aquifer definition research under Ambient Contract WM-206, ACDES contracted the present hydrogeologic study with the Florida Geological Survey (FGS). The primary purpose of this project is to attempt to improve the existing hydrogeologic information through lithologic and hydrogeologic characterizations of the sediments overlying the Floridan aquifer system in Alachua County. These sediments locally comprise both the intermediate aquifer system and associated confining beds and the surficial aquifer system. In addition, the continuity and lithology of hydrogeologic units within these post-

Eocene sediments directly determine groundwater and contaminant movement in the aquifer systems. A detailed study of the lithology, mineralogic composition, and relative permeability of these sediments would therefore aid in better understanding their hydrogeologic nature, extent, and their hydrogeologic relationship with the underlying Floridan aquifer system.

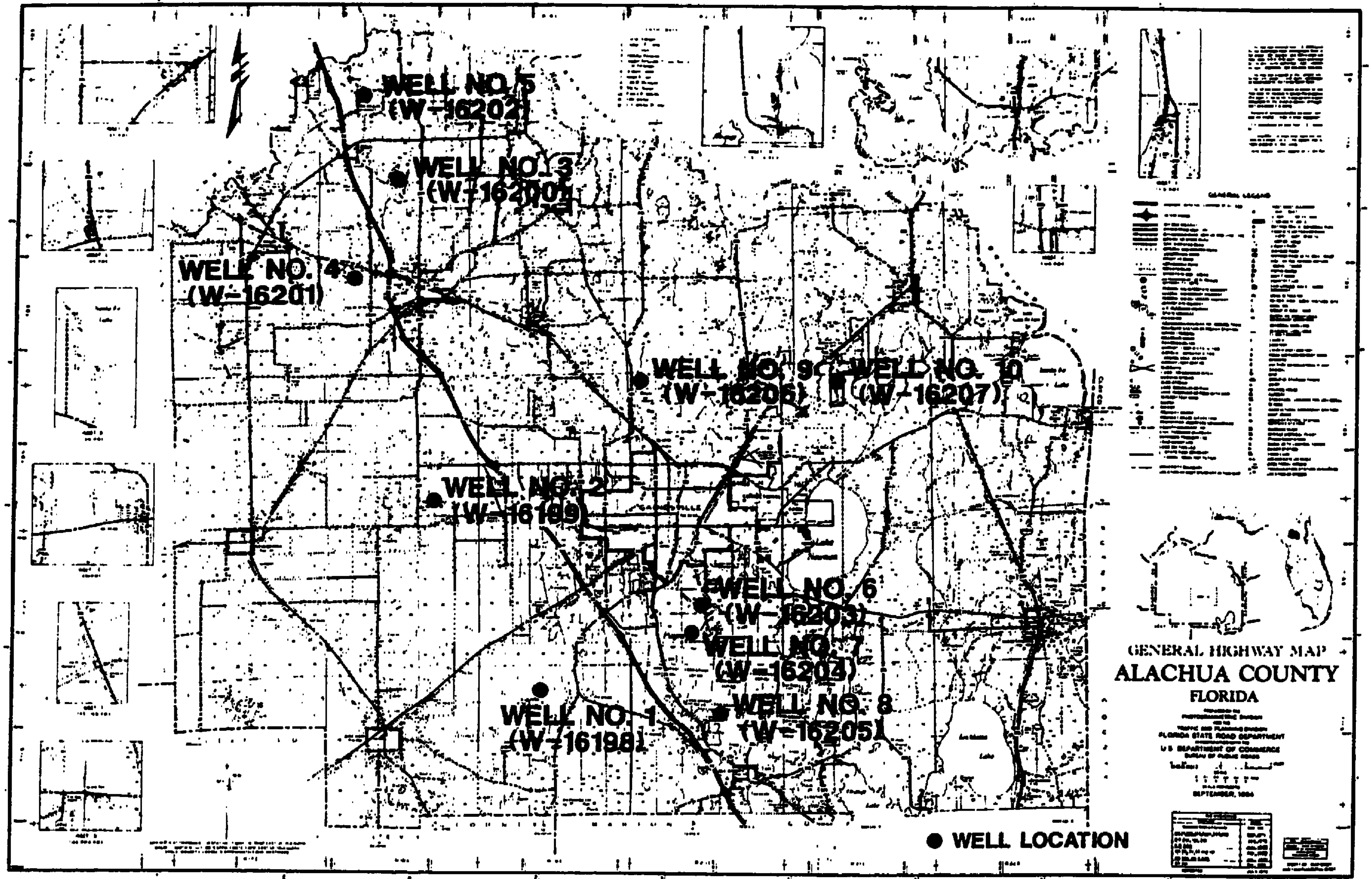
In the initial phase of this contract, the FGS provided its core-drilling rig, personnel, and split-spoon sampling equipment. Over a three month period, the post-Eocene sediments overlying the Floridan aquifer system at ten pre-selected sites throughout the county were drilled and sampled. A series of split-spoon cores and cuttings were recovered from nine locations, and a continuous two-inch core was taken at the tenth site. Phase two of the study involved laboratory analyses of the cores by research assistants at the FGS. As detailed in the methodology section of this report, the samples were described lithologically, analysed for mineralogy and grain size, and tested for relative hydraulic conductivity. The result of these analyses are tabulated and discussed in succeeding sections of the report.

Volume II of this report contains the bulk of the untabulated raw data. This includes the x-ray mineralogical peak charts, sieve analysis data sheets, and the permeameter calculation forms.

METHODS

During the course of the project, a series of ten stratigraphic core tests were drilled at selected sites in Alachua County by the FGS drilling rig (See Figure 1). An attempt was made to completely penetrate the undifferentiated Pleistocene-Holocene

Figure 1: Core location map.


WELL NO. 5
(W-16202)
WELL NO. 3
(W-16200)
WELL NO. 4
(W-16201)
WELL NO. 9
(W-16206)
WELL NO. 10
(W-16207)
WELL NO. 2
(W-16199)
WELL NO. 6
(W-16203)
WELL NO. 7
(W-16204)
WELL NO. 1
(W-16198)
WELL NO. 8
(W-16205)
GENERAL HIGHWAY MAP
ALACHUA COUNTY
FLORIDA
● WELL LOCATION

section and the Hawthorn Group section, where present, in each well. The drilling was stopped when top of the Ocala Group was reached.

Two-foot split spoon samples were taken in each well at approximately ten-foot intervals downhole. The split-spoon sampler, consisting of a steel barrel, core catcher, and removable clear plastic liner, was hammer-driven through each interval. Split-spoon samples were taken in each well until the top of the Ocala Group was reached or until a hard, tight, or otherwise impenetrable lithology was encountered. The cores, contained within the clear plastic liner tubes, were sealed and sent to the FGS laboratory for analysis. Standard well cuttings, caught at the rig mud pan, were collected to cover the depth intervals between split-spoon cores.

A variety of geological techniques were employed in this study. The lithology of each sample was described using the Florida Geological Survey computer sample coding system. Falling-head permeameter tests were conducted on split-spoon core samples from each well to characterize the hydraulic conductivity of these sediments. Selected samples, generally corresponding to the split-spoon intervals, were sieved using a nest of 1/4 phi sieves to determine grain size distribution. The fraction of each sample finer than 4 phi was then pipetted to obtain a silt-clay distribution. Portions of the split-spoon samples, where applicable, were also analyzed on an x-ray diffractometer to determine to mineral components of both the bulk and clay fractions.

Core and cutting descriptions

Lithologic descriptions utilizing the Florida Geological Survey computer sample coding system were made for the 10 Alachua County Study wells and entered in the county well-file data base. Of these descriptions, nine were made from split-spoon cores, and one was made from the continuous core. Table 1 lists numbers, depths, elevations, and locations of the ten wells.

Split-spoon cores in polyurethane tubes were first sampled for permeameter analysis and then cut open lengthwise with a table saw. The cores were then arranged according to depth in cardboard core boxes. Samples for sieve and pipette analysis were subsequently taken from the split-spoon and continuous cores.

A binocular microscope was utilized in describing the lithologic characteristics of each cutting or core sample. The major characteristics described and recorded in the FGS computer coding system include sample color, porosity, lithology, induration, cement type, accessory minerals, and fossils. Formation tops were determined based on lithologic and/or paleontologic criteria. Rock colors were based on the Geological Society of America's Rock Color chart (Geological Society of America, 1984). Appendix I contains complete lithologic descriptions of each of the wells described in this study.

Permeameter Testing

Samples for permeameter testing were taken from each series of split-spoon core tubes recovered from the ten sites in Alachua County. These tubes consisted of a PVC core tube which was filled

TABLE 1

ALACHUA COUNTY WELLS STUDIED IN THIS PROJECT

Study Well Number	Accession Number	Location T	R	S	Elevation* (Feet)	Total Depth (Feet)
1	16198	11S	19E	09	70	50
2	16199	09S	18E	35	120	36.5
3	16200	07S	18E	27	160	90
4	16201	08S	18E	17	115	53
5	16202	07S	18E	05	140	101
6	16203	10S	20E	21	60	30
7	16204	10S	20E	28	60	42
8	16205	11S	20E	03	85	65
9	16206	09S	20E	06	175	125
10	16207	09E	21E	04	150	191

*From 7-1/2 minute U. S. G. S. topographic quadrangle maps.

with a two foot section of sediment. Permeameter sample preparation and set-up follow the standard procedure outlined in Appendix 2. In general, an attempt was made to choose the least disturbed section of each core tube, while keeping the sampling interval as consistent as possible. This involved visually inspecting each section of core tube for defects which would unduly influence the permeameter tests (e.g., air pockets in the sediment, void spaces, dried or cracked sediment). Each tube as then marked and a small length (5 cm) of tube cut from the section. After each sample was taken, it was covered at both ends with a polyurethane mesh in order to keep the sediment from escaping. The samples were then placed in a beaker of water for approximately 7-10 days in order to allow for at least partial saturation of the sample before the permeameter tests were preformed.

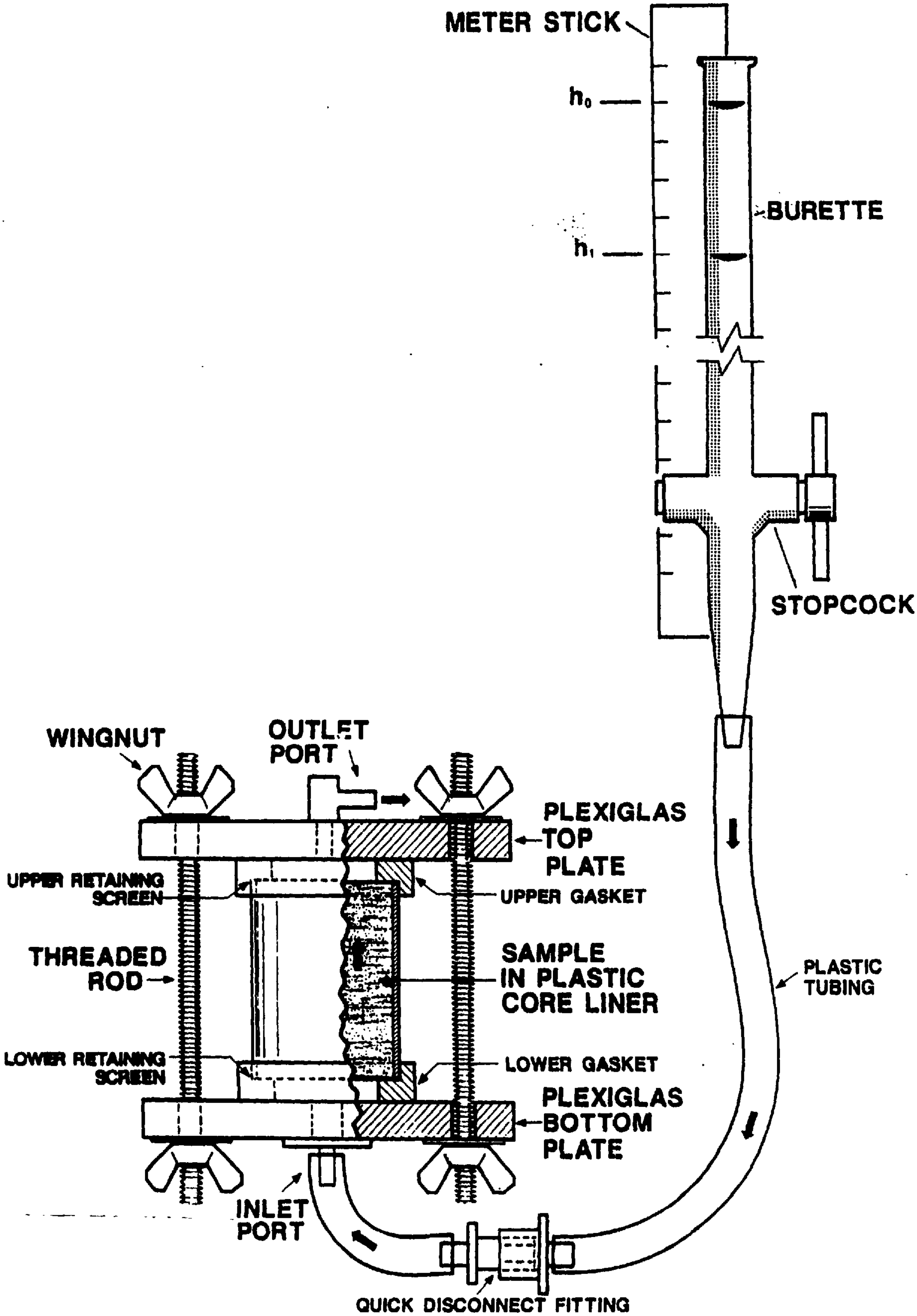
Each sample was placed on a permeameter for a period of time sufficient to conduct three falling-head permeability tests. This was usually about 72 hours per test. Figure 2 illustrates a typical falling-head permeameter as used in this study. In each of these tests, the initial head, the final head, the total elapsed time of the test, the volume of the sample, the volume of water which passed through the sample, and the water temperature were measured. They hydraulic conductivity (K) of the sample was then determined for each test according to the formula:

$$K=2.303al/At(\log_{10}h_o/h_1)T_c$$

Appendix 2 provides additional information on the permeameter set up, and defines the terms in this formula.

Each sample was allowed to stay on the permeameter as long as

Figure 2: Typical Falling-head Permeamter setup.



← *WATER FLOW DIRECTION*

was necessary to conduct three tests. Table 2 summarizes the theoretical times required to test for three different magnitudes of hydraulic conductivity (K). For a sample of very low K (10^{-8}), the time needed to conduct a complete test is 16 days. Since there were only five permeameters available for use, and since there were 47 samples to be analyzed, it was not possible to leave all samples on the permeameter for such a long period of time. Therefore, a decision was made to leave the samples on a permeameter for up to 21 days. If, after this amount of time, a sample had not allowed water to pass through, the sample was removed from the permeameter and was deemed to be relatively impermeable. If a sample did show evidence of flow within this period of time, it was allowed to remain on the permeameter until three tests could be performed. The results of the permeameter tests performed on the split-spoon samples are presented in Table 3. Values obtained for the coefficient of hydraulic conductivity give only a relative measure of sediment permeability. In general, the larger the negative exponent obtained from testing, the poorer the respective sediments are as an aquifer. Table 4 shows some comparitive K values for various soil and rock type.

Sieve Analysis

Samples were taken from each of the appropriate split-spoon core tubes for grain size analysis. Each tube of sediment was visually inspected in order to estimate the combined sand and silt percentage. If a sample was estimated to contain more than 50% sand or silt sized grains, a small portion (between 50 and 100 grams) of the interval was sampled for grain size analysis. If,

TABLE 2

THEORETICAL TIMES NEEDED TO CONDUCT (1) TEST ON A SAMPLE OF GIVEN HYDRAULIC CONDUCTIVITY (K)

K(CM/SEC)	t(SEC) H_O=60CM/H_1=55CM	t(DAYS) H_O=60CM/H_1=55CM	t(SEC) H_O=60CM/H_1=59CM	t(DAYS) H_O=60CM/H_1=59CM
5.00×10^{-7}	1.34×10^{5}	1.55	2.57×10^{4}	0.299
5.00×10^{-8}	1.34×10^{6}	15.45	2.57×10^{5}	2.99
5.00×10^{-9}	1.34×10^{7}	154.55	2.57×10^{6}	29.9

THIS TABLE WAS CALCULATED USING THE FORMULA IN APPENDIX 2

VALUES USED FOR THE VARIOUS CONSTANTS ARE TYPICAL NUMBERS

VALUES USED ARE:

a= 1.72 CM^2

A= 9.08 CM^2

L= 5.0 CM

T_C= 0.81 (T = 24 DEGREES CELSIUS)

C= 2.1815

TABLE 3: RESULTS OF PERMEAMETER ANALYSIS OF SELECTED SAMPLES

WELL NUMBER 1. W-16198 COUNTY ALACHUA

LOCATION : T11S R19E S09

SAMPLE DEPTH	HYDRAULIC CONDUCTIVITY (CM/SEC)
10.5-12.5	2.62×10^{-8}
20.5-22.5	2.31×10^{-8}
30.5-32.5	6.60×10^{-6}
40.5-42.5	2.62×10^{-6}

WELL NUMBER 2. W-16199 COUNTY ALACHUA

LOCATION : T09S R18E S35A

SAMPLE DEPTH	HYDRAULIC CONDUCTIVITY (CM/SEC)
10.5-12.5	1.31×10^{-8}
20.5-22.5	1.49×10^{-8}
30.5-32.5	1.41×10^{-8}

WELL NUMBER 3. W-16200 COUNTY ALACHUA

LOCATION : T17S R18E S27AA

SAMPLE DEPTH	HYDRAULIC CONDUCTIVITY (CM/SEC)
10.5-12.5	1.70×10^{-8}
20.5-22.5	1.77×10^{-8}
30.5-32.5	2.75×10^{-7}
40.5-41.5	1.24×10^{-4}
41.5-42.5	7.73×10^{-5}
50.0-52.0	4.86×10^{-7}

WELL NUMBER 4. W-16201 COUNTY ALACHUA

LOCATION : T08S R18E S17AB

SAMPLE DEPTH	HYDRAULIC CONDUCTIVITY (CM/SEC)
10.5-12.5	6.17×10^{-7}
30.5-32.5	6.64×10^{-7}
40.5-42.5	NO FLOW
50.5-52.5	2.35×10^{-7}

WELL NUMBER 5. W-16202 COUNTY ALACHUA

LOCATION : T17S R18E S05BD

SAMPLE DEPTH	HYDRAULIC CONDUCTIVITY (CM/SEC)
10.5-12.5	2.72×10^{-7}
20.5-22.5	1.24×10^{-8}
30.5-31.0	1.10×10^{-7}
43.5-45.0	5.01×10^{-8}
50.5-52.5	NO FLOW
60.5-62.5	6.30×10^{-8}
85.5-87.5	5.47×10^{-7}
90.5-91.0	5.49×10^{-6}

WELL NUMBER 6. W-16203 COUNTY ALACHUA

LOCATION : T10S R20E S21BD

SAMPLE DEPTH	HYDRAULIC CONDUCTIVITY (CM/SEC)
10.5-12.5	2.48×10^{-7}
20.0-22.0	NO FLOW

WELL NUMBER 7. W-16204   COUNTY ALACHUA

LOCATION : T10S R20E S28

SAMPLE DEPTH	HYDRAULIC CONDUCTIVITY (CM/SEC)
20.0-22.0	9.60×10^{-8}
30.0-32.0	5.62×10^{-7}

WELL NUMBER 8. W-16205   COUNTY ALACHUA

LOCATION : T11S R20E S03

SAMPLE DEPTH	HYDRAULIC CONDUCTIVITY (CM/SEC)
10.0-12.0	2.78×10^{-6}
20.0-22.0	1.92×10^{-6}
40.0-42.0	NO FLOW
50.0-52.0	NO FLOW
60.0-61.5	4.61×10^{-5}
61.5-62.0	1.94×10^{-6}

WELL NUMBER 9. W-16206 COUNTY ALACHUA

LOCATION : T09S R20E S06

SAMPLE DEPTH	HYDRAULIC CONDUCTIVITY (CM/SEC)
10.0-12.0	2.89×10^{-4}
20.0-22.0	5.60×10^{-8}
30.0-32.0	1.62×10^{-6}
43.0-45.0	1.78×10^{-7}
50.0-52.0	9.75×10^{-8}
70.0-71.0	NO FLOW
80.0-81.0	NO FLOW
100.0-101.0	NO FLOW
110.0-111.0	NO FLOW

WELL NUMBER 10. W-16207 COUNTY ALACHUA

LOCATION : T09S R21E S04

SAMPLE DEPTH	HYDRAULIC CONDUCTIVITY (CM/SEC)
10.0-11.0	2.66×10^{-5}
36.0-37.0	5.94×10^{-7}
47.0-49.0	1.05×10^{-7}

TABLE 4: AVERAGE RANGES OF HYDRAULIC CONDUCTIVITY FOR VARIOUS GEOLOGIC MATERIALS (Adapted From Freeze and Cherry, 1979 and Davis and DeWiest, 1966)

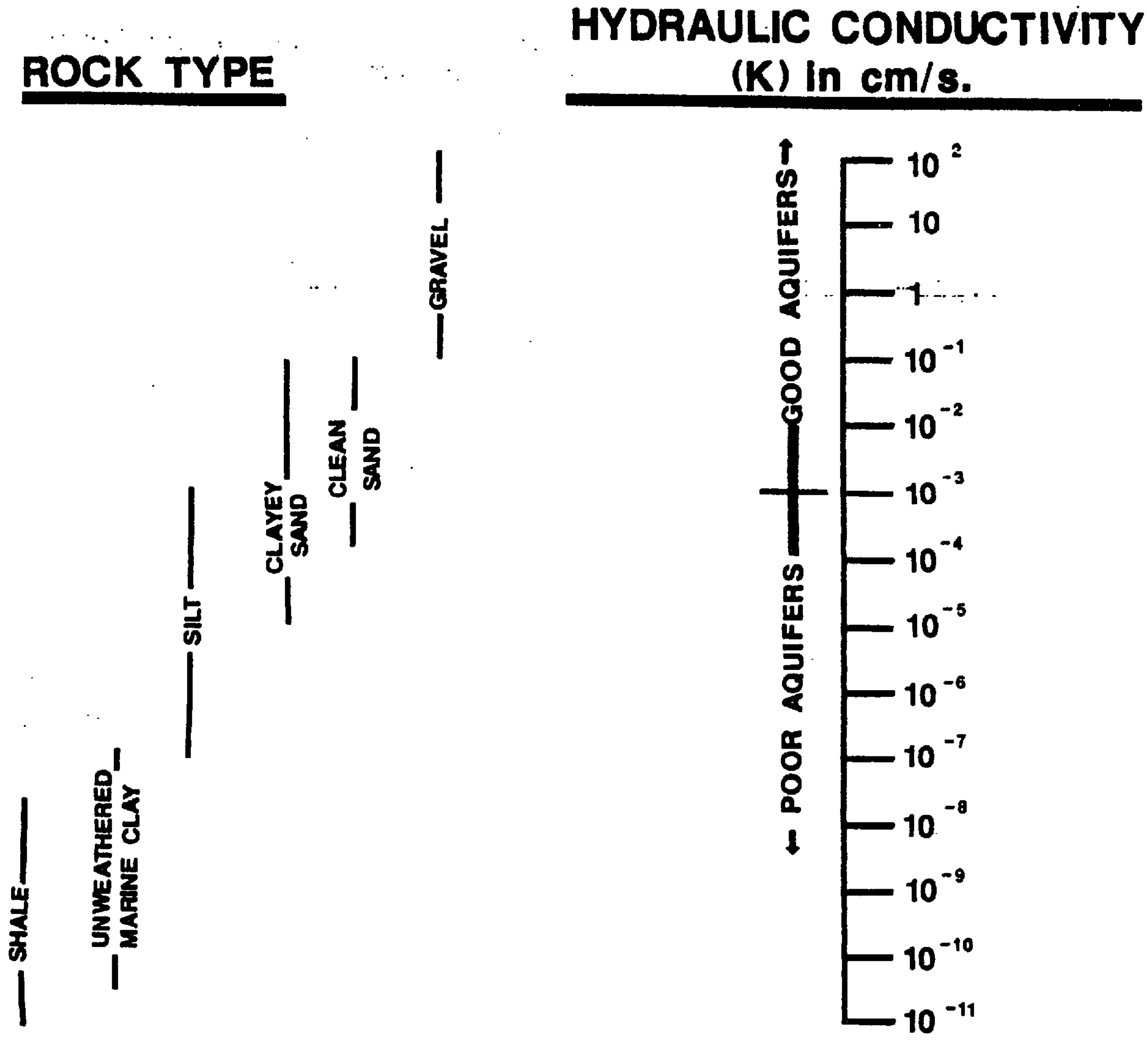


TABLE 5: GRAIN SIZE ANALYSIS RESULTS

ALACHUA COUNTY

WELL #1. W-16198 LOCATION: T 11S R 19E S 09

SAMPLE DEPTH	SAND %	SILT %	CLAY %
20.5-22.5	62.92	16.58	20.50
30.5-32.5	86.90	3.95	9.14
41.5-42.5	94.62	3.53	1.58

WELL #2.W-16199 LOCATION: T 09S R 18E S 35A

SAMPLE DEPTH	SAND %	SILT %	CLAY %
10.5-12.5	69.71	13.65	16.55
30.5-32.5	59.63	17.89	22.21

WELL #3. W-16200 LOCATION: T 17S R 18E S 27AA

SAMPLE DEPTH	SAND %	SILT %	CLAY %
10.5-12.5	60.10	(39.90 COMBINED)	
20.5-22.5	51.09	11.40	36.96
30.5-32.5	80.45	6.39	13.31
50.0-52.0	82.23	11.29	6.32

WELL #4. W-16201 LOCATION: T 08S R 18E S 17AB

SAMPLE DEPTH	SAND %	SILT %	CLAY %
10.5-12.5	67.92	13.86	18.19
30.5-32.5	80.92	7.49	11.45
40.5-42.5	74.12	13.43	12.25

WELL #5. W-16202 LOCATION: T 17S R 18E S 05BD

SAMPLE DEPTH	SAND %	SILT %	CLAY %
10.5-12.5	79.71	3.23	16.97
43.5-45.0	69.87	6.82	23.61
85.5-87.5	81.50	5.29	13.64
90.5-91.0	68.73	22.11	9.89

WELL #6. W-16203 LOCATION: T 10S R 20E S 21BD

SAMPLE DEPTH	SAND %	SILT %	CLAY %
10.5-12.5	76.85	1.65	21.87

WELL #7.W-16204 LOCATION: T 10S R 20E S 28

NOT ANALYZED

WELL #8. W-16205 LOCATION: T 11S R 20E S 03

SAMPLE DEPTH	SAND %	SILT %	CLAY %
10.0-12.0	85.60	2.35	11.84
20.0-22.0	77.26	3.84	18.63
60.0-61.5	89.38	1.94	7.06

WELL #9. W-16206 LOCATION: T 09S R 20E S 06

SAMPLE DEPTH	SAND %	SILT %	CLAY %
10.0-11.0	78.33	3.21	18.46
20.0-22.0	47.91	8.55	43.54
50.0-52.0	68.00	5.21	26.78
60.0-62.0	82.06	5.69	12.25

WELL #10, W-16207 LOCATION: T 09S R 21E S 04

SAMPLE DEPTH	SAND %	SILT %	CLAY %
10.0-11.0	76.76	3.53	19.71
47.0-49.0	52.06	22.85	25.09

on the other hand, the predominant grain size was estimated to be in the clay range, that core tube was not sampled for grain size analysis of a sample which is predominantly clay is not statistically meaningful. In addition to the split-spoon grain size samples, a total of fourteen samples were taken from selected intervals within the continuous core (Well No. 10, W#16207) which was drilled for this project.

Each of the samples which were chosen for grain-size analysis were weighed and dried slowly at a constant temperature of 35 degrees Celsius. The dried samples were taken reweighed and the water content of each sample was calculated. This gave a minimum estimate of porosity when the water content of the sample was divided by the volume of the sample. This is a minimum porosity because the samples were not fully saturated before the initial weighing.

Each sample was then placed in a beaker with a known volume of a dispersing agent (sodium hexametaphosphate) and stirred vigorously in order to disperse the clay fraction and facilitate wet sieving of the sample to remove the clays. Following this bath, the sample was run through a 4 phi wet sieve in order to remove the silt and clay fraction. This fraction was collected in a beaker and saved for pipette analysis.

The fraction coarser than 4 phi was saved and dried. The weight of this coarse fraction was calculated and subtracted from the total dry weight of the sample. The resultant loss upon wet sieving was assumed to be the combined silt and clay weight.

Following these calculations, the sand fraction was placed in a next of 1/4 phi interval sieves which ranged from -1.25 phi to 4.00 phi. If the total weight of the coarse fraction was more than 75 grams, the sample was split using a mechanical splitter, and one half of the sample was sieved. If the total weight of the coarse fraction was less than 75 grams, the whole coarse fraction was sieved. This nest of sieves was placed on a Ro-Tap machine for 30 minutes.

The sieves were then removed from the Ro-Tap and the individual sieves were cleaned. The weight of the sand fraction on each sieve was measured and recorded. The pan fraction (that fraction of the "coarse" sample which was finer than 4 phi) was saved and added to the beaker which contained the fine fraction. The totals of both the fine and coarse fractions were then mathematically adjusted (the pan fraction weight was subtracted from the "coarse" fraction weight, and added to the "fine" fraction weight). This allowed for a more accurate representation of the percentage of sand and silt-clay fraction for each sample.

Pipette Analysis

The fine grained sediments (4 phi or less) collected during sieving procedures were evaluated for their silt and clay fractions using the pipette method (Friedman and Johnson, 1982; Folk, 1974). Fines from each split-spoon sample, except those in for W-16207, were pipetted. Time constraints precluded pipetting samples from well W-16207. One sample from well W-16200 was not pipetted because the sample fines flocculated.

Each sample was first dispersed in a known concentration of dispersing agent and then poured into a 1000 ml graduated cylinder.

Distilled water was added to the cylinder until the fluid/sediment column reached the 1000 ml level. The fluid/sediment column was then stirred vigorously for 1 minute prior to initiation of the experiment. After stirring, 20 ml withdrawals (or 25 ml depending on pipette used) were made at predetermined time intervals and depths appropriate to recover fines representative of each phi size class from 4 phi to 9 phi. Each aliquot (fraction) was released into a preweighed 50 ml beaker. The pipette was then filled with distilled water and rinsed into the same beaker to recover fines that may have adhered to the pipette interior. The beakers containing the aliquots were then oven dried at 100 degrees C to evaporate the water content of the sample. Upon drying, the aliquot beakers were removed from the oven and allowed to equilibrate to room temperature (24 degrees C) for 30 minutes before weighing.

After determining the aliquot weight (Friedman and Johnson, 1982; Folk 1974) the weight in each phi class was calculated. Using the phi class weights, weight percentages and cummulative weight percentages for each phi class from 4 to 9 phi were calculated to determine the clay and silt fractions of each sample. Table 5 lists the sand, silt, and clay percentages for each sample.

X-ray Diffraction Analysis

X-ray diffraction (XRD) studies are useful for the identification of the various minerals in a sample, but are semi-quantitative, at best, for determination of the exact mineral abundance or percentage. The purpose of this portion of the Alachua County project was to use an x-ray diffractometer to investigate the mineralogy of the ten study wells.

Representative samples for XRD analyses were collected at selected intervals in wells W-16198 through W-16207. The XRD samples were collected immediately above or below the location of the permeameter samples, thus the mineralogy of permeameter samples may be assumed to match that of the intervals reported in this section. Samples were also collected from well W-16207, which is a continuous core, whenever there was a change in lithology. Therefore, well W-16207 sample intervals are quite variable.

Two approaches of the XRD analysis were chosen for the samples. The first approach was to analyze the sample as a "bulk" sample. Approximately 20-30 grams of each sample was ground to a fine powder. This procedure insured homogeneous mixing of the sample and reduced the chance of preferential orientation of certain minerals during analysis. The sample was then placed into planchets (sample holders) and placed into the x-ray diffractometer. The diffractometer records the x-ray reflections as peaks, both in a computer and on a paper chart or graph. Every mineral exhibits a series of characteristic peaks, which are used to determine the presence of the mineral. These charts are included in this report as an appendix. The x-ray pattern for each sample begins at a 2-theta angle of four degrees so that all major clay mineral peaks could be identified. The second approach, used with approximately 85 percent of the samples, was to analyze the mineralogy of the clay-size fraction by first physically separating the clay particles from the bulk sample. The separation was achieved by suspending the clay minerals in water with a Calgon dispersant and allowing the larger particles to settle. Samples of the clay fraction were decanted onto glass slides and dried to produce oriented samples for XRD.

The results of the XRD analysis are listed in Tables 6 and 7. The sample number and interval are listed in the first two columns of each table. The subsequent columns are for the minerals identified. A total of eleven minerals were positively identified. Table 6 contains the results of the bulk mineral analyses, and Table 7 contains the results of the clay fraction analyses. Mineral abundances were determined from the relative peak heights. When possible, estimates of relative abundances were made, with C1 - C2 - C3 representing abundance in descending order. Quartz (SiO_2) is virtually ubiquitous in the samples. Opaline quartz (partially hydrated silica) is present in trace amounts in a few samples. Two forms of calcium carbonate ($CaCO_3$), calcite and aragonite, are common, and dolomite, a calcium-magnesium carbonate, $CaMg(CO_3)_2$) is also common. Phosphate minerals are abundant in numerous samples. The type of phosphate abundant in sediments overlying the Floridan aquifer system in carbonate-fluorapatite, $(Ca_{10}(PO_4)_6(F, OH, CO_3)_2$, commonly known as francolite. This mineral is a form of apatite in which fluorine and carbonate ions partially substitute for hydroxyl groups.

A variety of phosphate-bearing minerals, known as secondary phosphates, are derived from the chemical weathering of francolite. These minerals form authigenically in the sediments. The phosphate mineral wavellite, $(Al_3)PO_4)_2(OH)_9*3H_2O$, another secondary phosphate mineral, has tentatively been identified in one sample.

TABLES 6 AND 7. BULK AND CLAY FRACTION X-RAY DIFFRACTION DATA

In these two tables of x-ray diffractometer data, the following abbreviations have been used: QTZ = quartz; CAL = calcite; ARG =aragonite; DOL = dolomite; OPA = opaline quartz; PHO = francolite orcarbonate-fluorapatite; WAV = wavellite; KAL = kaolinite; MON =montmorillonite; ILL = illite; PAL = palygorskite. The phosphate mineral millisite is most likely present in one sample (well #8-2); the clay mineral sepiolite is present in one sample (well #8-6), and a calcium zeolite mineral is present in one sample from well #4 (#4-1).

The letter C implies that the mineral is common, or abundant. Based on relative peak heights, the most common mineral is listed as C1 and the second most abundant mineral is listed as C2, and so forth, when more than one mineral is present. The letter T implies that the mineral is present in trace amounts, and is not a major constituent of the sample.

TABLE 6: BULK X-RAY DIFFRACTOMETER DATA

		MINERALS						
SAMPLE #	INTERVAL	QTZ	CAL	ARG	DOL	PHO	WAV	OPA
WELL #1	(FEET)							
W-16198								
1	10.5-12.5	C						
2	20.5-22.5	C						
3	30.5-32.5	C						
4	40.5-42.5	C						
WELL #2								
W-16199								
1	10.5-12.5	C						
2	20.5-22.5	C						
3	30.5-32.5	C1				C2	C3	T
WELL #3								
W-16200								
1	10.5-12.5	C						
2	20.5-22.5	C1				T		
3	30.5-32.5	C1				C2		
4	40.5-42.5	C1				C2		
5	50.0-52.0	C						
WELL #4								
W-16201								
1	10.5-12.5	C						
2	30.5-32.5	C1				T		
3	40.5-42.5	C1				C2		
4	50.0-52.5					C		

WELL #5
W-16202

1	10.5-12.5	C					T	
2	20.5-22.5	C						
3	30.5-32.5	C1				C2		T
4	40.5-42.5	C1				C2		
5	50.5-52.5	C1				C2		T
6	60.5-62.5	C1				C2		
7	85.5-87.5	C1				C2		
8	90.5-91.0	C1	T			C2		

WELL #6
W-16203

1	10.5-12.5	C						
2	20.0-22.0	C1				C2		

WELL #7
W-16204

1	10.0-12.0	C1				C2		
2	20.0		C1	C2				
3	20.0		C1	C2				
4	30.0-32.0	T	C					

WELL #8
W-16205

1	10.0-12.0	C						
2	20.0-22.0	C1				C3	C2	
3	30.0-32.0	C						
4	40.0-42.0	C2			C1	C3		
5	50.0-52.0	C1				C2		
6	60.0-62.0	C1	C2			C3	T	

WELL #9
W-16206

1	10.0-12.0	C						
2	20.0-22.0	C						
3	30.0-31.0	C2			C1	T		
4	43.0-45.0	C1			C2	C3		
5	50.0-52.0	C1			C2	C3		
6	60.0-62.0	C2		C1		C3		
7	70.0-71.0	C1			C2	C3		
8	80.0-81.0	C2			C1			
9	100.0-101.0	C						
10	110.0-111.0	C1			C2	C3		

SAMPLE #	INTERVAL (FEET)	QTZ	CAL	MINERALS ARG	DOL	PHO	WAV	OPA
WELL #10								
W-16207								
1	4.0	C						
2	9.0	C						
3	10.0-12.0	C						
4	14.0	C1					C2	
5	19.0	C						
6	20.0-22.0	C						
7	25.0	C1				C2		
8	27.5	C1				C2		
9	29.0	C2		C3	C1	T		
10	30.0-32.0	C2	C3		C1	T		
11	35.0	C1			C2	T		
12	38.5	C1			T	C2		
13	40.0-42.0	C2	T		C1	C3		
14	42.0			C1	C2	T		
15	46.0	C1			C2	T		
16	50.0-52.0	C2			C1	C3		
17	54.0	C1			C2	T		
18	60.0-62.0	C2	T		C1	C3		
19	61.5	C2			C1	C3		
20	67.5	C2			C1	C3		
21	70.0			C2	C1			
22	76.0	T			C			
23	78.0			T	C			
24	83.0	C2			C1			
25	87.0	C1			C2	C3		
26	95.5				C	T		
27	104.5	C1			C2			
28	110.0	C2			C1			
29	126.0	T	T	C1				
30	162.5	C3	C1	C2				
31	167.0	C1			C2	C3		
32	174.0	C	T					
33	182.0		C					

TABLE 7: CLAY SEPARATE X-RAY DIFFRACTOMETER DATA

SAMPLE #	INTERVAL (FEET)	MINERALS KAL	ILL	PAL	MON	WAV	QTZ	CAL	DOL	PHO	ARG
WELL #1											
W-16198											
1	10.5-12.5	C1	C2								
2	20.5-22.5	C1	C3	C2							
3	30.5-32.5	C1	C2				T				
4	40.5-42.5	C2	C3	C1							
WELL #2											
W-16199											
1	10.5-12.5	C1	C2								
2	20.5-22.5	C1	C3			C2					
WELL #3											
W-16200											
1	10.5-12.5		C1	C2							
2	20.5-22.5		C1							T	T
3	30.5-32.5		C1				T				
4	40.5-42.5		C2	C1							
5	50.0-52.0		C1								
WELL #4											
W-16201											
1	10.5-12.5	T	C2		C1						
2	30.5-32.5	T	T			C2				C1	
3	40.5-42.5		C								
4	50.0-52.5			T						C	
WELL #5											
W-16202											
1	10.5-12.5	C1	T			C2					
2	20.5-22.5		C1	C2			T				
3	30.5-32.5						C1			C2	
4	40.5-42.5	T					C				
5	50.5-52.5		T							T	
6	60.5-62.5		C1	C2						T	
7	85.5-87.5		C	T							
8	90.5-91.0	No sample prepared									
WELL #6											
W-16203											
1	10.5-12.5	C1	T	T			T				
2	20.0-22.0	T								C	

SAMPLE #	INTERVAL (FEET)	KAL	ILL	PAL	MON	WAV	QTZ	CAL	DOL	PHO	AR
					MINERALS						
WELL #7											
W-16204											
1	10.0-12.0		T		C1		T				
2	20.0	No sample prepared									
3	20.0-22.0			T				C			
4	30.0-32.0	C1						C2			
WELL #8											
W-16205											
1	10.0-12.0	C1		C2							
2	20.0-22.0	No sample prepared									
3	30.0-32.0		C1		T		C2				
4	40.0-42.0		C2						C1		
5	50.0-52.0		C2	C1			C3		T	T	
6	60.0-62.0						T			T	
WELL #9											
W-16206											
1	10.0-12.0	C									
2	20.0-22.0	C	T								
3	30.0-31.0	C1		C2					T		
4	43.0-45.0		C2				C1				
5	50.0-52.0	No sample prepared									
6	60.0-62.0	C1	T							C2	
7	70.0-71.0		C3				C1		C2		
8	80.0-81.0		C1	C2							
9	100.0-101.0		C1	C2							
10	110.0-111.0		C1	C3			C2				
WELL #10											
W-16207											
1	4.0		T				C				
2	9.0	C2	C3				C1				
3	10.0-12.0	C1		C2							
4	14.0	C									
5	19.0	No sample prepared									
6	20.0-22.0	C2	C1								
7	25.0	C2	C3				C1				
8	27.5	No sample prepared									
9	29.0	No sample prepared									
10	30.0-32.0	No sample prepared									
11	35.0	T	C1						C2	T	
12	38.5		C								
13	40.0-42.0	No sample prepared									
14	42.0	C									
15	46.0	No sample prepared									
16	50.0-52.0	No sample prepared									

SAMPLE	INTERVAL	KAL	ILL	PAL	MON	WAV	QTZ	CAL	DOL	PHO	ARG
		MINERALS									
WELL #10 (continued)											
W-16207											
17	54.0			C2			C3		C1		
18	60.0-62.0	No sample prepared									
19	61.5		C								
20	67.5			C3			C2		C1		
21	70.0			C1					C2	C3	
22	76.0		T	C2			T		C1		
23	78.0	No sample prepared									
24	83.0			C2					C1		
25	87.0			C	T						
26	95.5			C2					C1		
27	104.5	No sample prepared									
28	110.0			C2					C1		
29	126.0			T			C		T		
30	162.5	T		C2				C1			
31	167.0			C							
32	174.0			C1			C3	C2			
33	182.0	No sample prepared									
		KAL	ILL	PAL	MON	WAV	QTZ	CAL	DOL	PHO	ARG

NOTE: The clay fractions contain fine-grained quartz, dolomite, calcite and phosphate (in the form of francolite) as well as various clay minerals.

Kaolinite, smectite, illite, and palygorskite are the predominant clays present. The clay samples were not glycoated, and the illite and smectite components are lumped as the smectite group in Table 7. Hetrick and Friddell (1984) report that, in general, smectite is the more common clay mineral in Hawthorn Group sediments in north Florida and Georgia.

DISCUSSION

In Alachua County, the upper Floridan aquifer system is comprised of porous marine limestones of the Eocene Ocala Group. Locally, the Floridan aquifer system is overlain by varying thicknesses of post-Eocene siliciclastics and occasional calcareous beds. West of Interstate 75, the Ocala Group is overlain by generally thin undifferentiated Plio-Pleistocene sands and clayey sands. A shallow surficial aquifer system may be present in portions of this area. Throughout most of this area however, the Floridan aquifer system is unconfined, allowing contaminants direct access to the aquifer (Macesich, 1988).

East of Interstate 75, the Floridan aquifer system is overlain by up to 160 feet of Miocene age Hawthorn Group siliciclastics and carbonates (Scott, 1988; Macesich, 1988). Porous sands and carbonate units in the Hawthorn Group locally comprise the intermediate aquifer system. In areas of the county where low permeability clay units of the Hawthorn overlie the Floridan aquifer system this group also forms the intermediate confining unit.

The sample sites in the present study were situated in areas where little or no data is available on the lithologic and hydrogeologic characteristics of the sediments comprising the surficial aquifer system and the intermediate confining unit.

In order to obtain a complete representation of the post-Eocene sediments, an attempt was made by the drill rig personnel to penetrate the entire sediment section overlying the Ocala Group limestone. Drilling stopped when the first fragments of Ocala Group limestone were brought up in the drilling mud. In one well, however (number 8, W-16205), drilling problems prevented proceeding to the top of the Ocala Group. The location, lithology and hydrogeologic aspects of each well are discussed individually in the following discussion section.

Well No. 1 (FGS accession number W-16198) was drilled on a hillside slope at the northeastern edge of the Kanapaha Prairie. The surrounding terrain is comprised of gently rolling siliciclastic hills resting on Ocala Group limestones. Karst features have modified the surface relief with abundant solution depressions and sinks. Macesich (1988) characterized the region as a zone where confining clay sediments of the Hawthorn Group above the Floridan aquifer system are perforated.

Figure 3 illustrates the lithology of the sediments penetrated by Well No. 1. Due to encountering extremely hard Ocala Group chert at a depth of 50 feet, the drilling stopped. The predominate lithology in Well No. 1 is unfossiliferous, clayey quartz sand, with occasional interbedded clay beds. Four split-spoon cores were taken, spanning depth intervals of 10.5 to 12.5 feet below land surface (bls), 20.5 to 22.5 feet bls, 30.5 to 32.5 feet bls, and

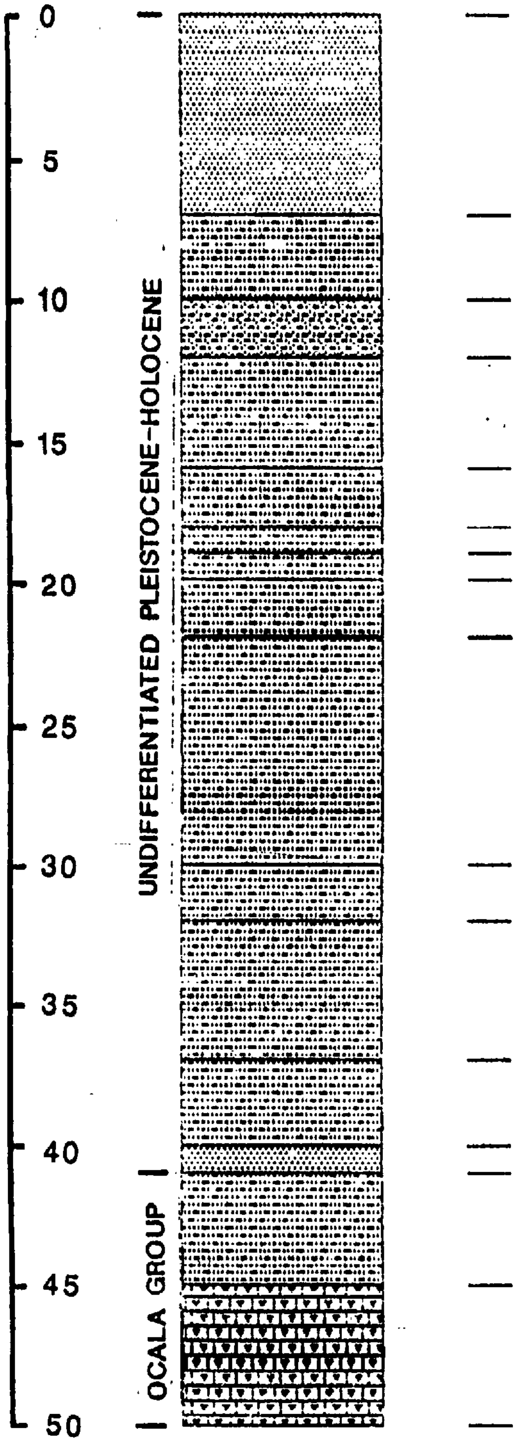
Figure 3: Columnar section for well #1 (W-16198).

DEPTH (FEET MSL)

W–16198

ELEVATION=70 FEET (MSL)

T.11S R.19E S.09 ALACHUA COUNTY



Moderate-brown organic-rich quartz sand.

Dark yellowish-brown clayey, organic-rich quartz sand.

Greenish-black sandy clay.

Grayish-brown clayey quartz sand.

Grayish-brown clayey quartz sand.

Grayish-brown to dark yellowish-brown clayey, organic-rich quartz sand.

Grayish-brown clayey, organic-rich, dolomitic quartz sand.

Grayish-orange clayey quartz sand.

Grayish brown to dark yellowish-brown clayey, organic-rich quartz sand.

Grayish-orange clayey quartz sand.

Grayish-brown to very light gray clayey, organic-rich quartz sand.

Grayish-brown to dark yellowish-brown clayey, dolomitic, organic-rich quartz sand.

Yellowish-gray calcareous, phosphatic quartz sand.

Grayish-brown clayey quartz sand with chert fragments and Eocene fossils.

Light blue-green to grayish-brown chert with sand and limestone fragments.

T.D.=50 FEET.

41.5 to 42.5 feet bls. Permeameter analyses of these intervals that the two shallow samples have surprising low conductivities, with magnitudes of only 10^{-8}cm/s (see Table 4). The shallowest sample, 10.5 to 12.5 feet bls, is an unfossiliferous greenish black, sandy, kaolinite-smectite clay (Table 7). This unit is most likely part of the undifferentiated Pleistocene-Holocene sediments, and therefore is associated with the surficial aquifer system. The deeper low-permeability beds occur in the split-spoon interval 20.5 to 22.5 feet bls. Although this interval is primarily quartz sand, with approximately 20.5% clay, the kaolinite-palygorskite-smectite clay matrix (Table 7) effectively seals the pore spaces in the sand.

The other two deeper split-spoon samples, 30.5 to 32.5 fe bls and 40.5 to 42.5 feet bls, show low hydraulic conductivity values of 10^{-6}cm/s (Table 4). These clayey, quartz sand intervals contain kaolinite-smectite or palygorskite-kaolinite-smectite mixtures (Table 7), which comprise less than 10 percent of each sample (Table 5). The lower clay content is the primary reason for the much higher conductivity values of the deeper split-spoon samples.

Most of the sediments penetrated by well W-16198, with the exception of the chert at 41.5 to 45 feet deep, appear to be undifferentiated post-Miocene. The chert represents a silicified layer developed at the top of the Ocala Group limestone.

Well No. 2 (W-16199) was drilled to a depth of 36.5 bls, where it penetrated the top of the Ocala Group. The well is situated at the western edge of the perforated aquifer zone, one mile south of the University of Florida Experimental Farm. Figure 4 illustrates the lithology of the sediments penetrated in Well No. 2. The top of the fossiliferous, calcilutitic, marine limestone of the Crystal River Formation of the Ocala Group was reached at 36 feet below land surface (bls). Clays and clayey quartz sands of the Miocene Hawthorn Group were penetrated from 36 to 30.5 feet bls, and Pleistocene-Holocene undifferentiated clayey sands were encountered between 0 to 30.5 feet bls.

Three split-spoon cores were taken in the depth intervals 10.5 to 12.5 feet bls, 20.5 to 22.5 feet bls, and 30.5 to 32.5 feet bls. All three samples were comprised of clayey, quartz sands, and all had very low hydraulic conductivity values of 10^{-8}cm/s (Table 4). Quartz was the most common mineral in the two intervals in the undifferentiated section. In the 10.5 to 12.5 feet bls interval, kaolinite and smectite are the predominant clays. The 20.5 to 22.5 feet bls sample contains kaolinite, wavelite, and smectite clays. Sample interval 30.5 to 32.5 feet bls is situated in the upper Hawthorn Group sediments. Quartz, francolite, and wavelite are the dominant minerals present (Table 6).

Well No. 3 (W-16200) was drilled four miles north of Alachua, just east of Alligator Road. The well site is located in the rolling hills at the western edge of the Northern Highlands geomorphic zone (White, 1970). Figure 5 is a columnar section illustrating the lithologic units penetrated in this well. The well bottomed at 90 feet bls, at or very near the top of the Ocala Group limestone. Typical Ocala Group forminifera in the last sample suggest the top of the limestone was reached.

Figure 4: Columnar section for well #2 (W-16199).

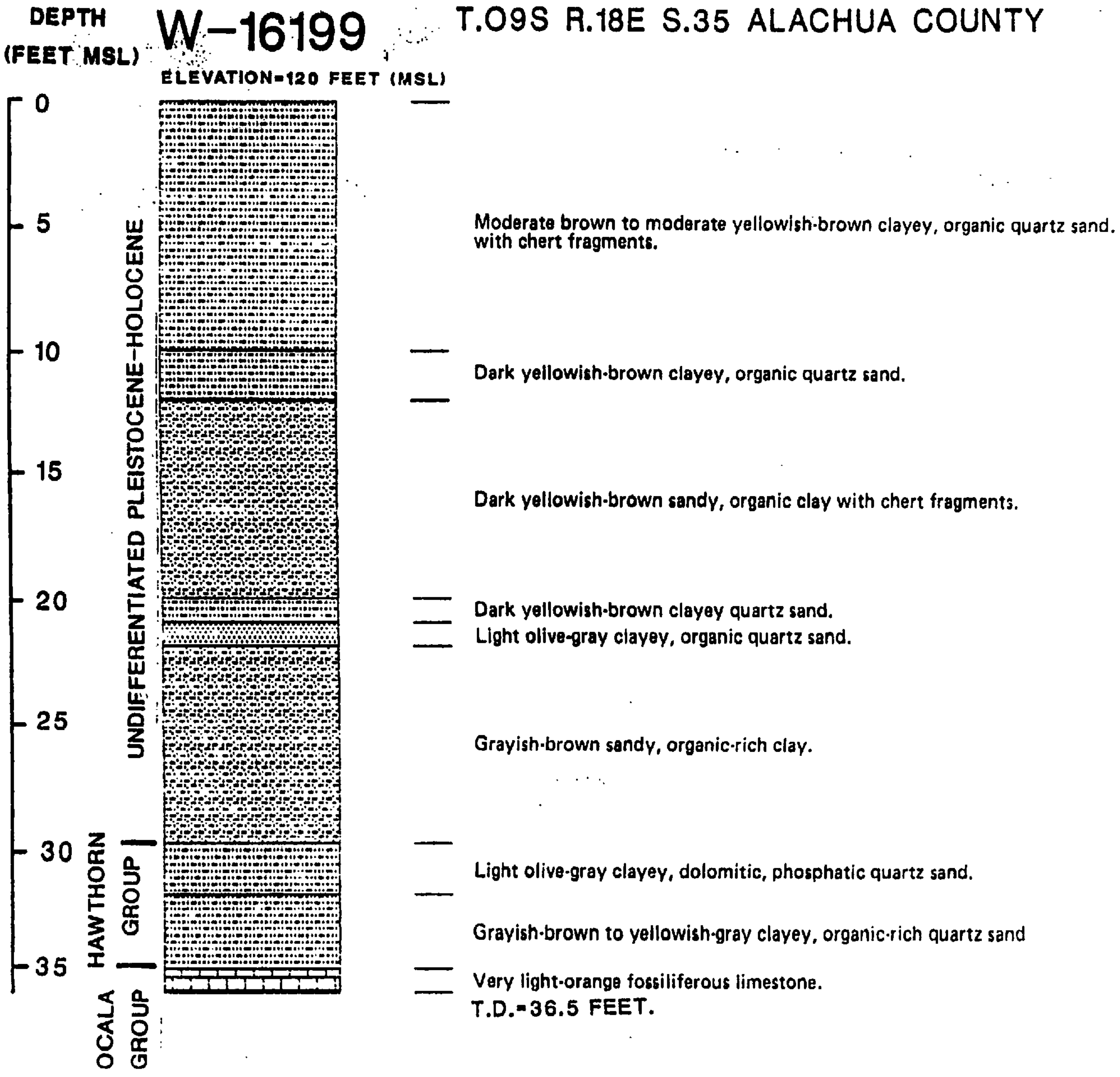

DEPTH
(FEET MSL)
W-16199
T.O9S R.18E S.35 ALACHUA COUNTY
ELEVATION=120 FEET (MSL)
0
5
10
15
20
25
30
35
UNDIFFERENTIATED PLEISTOCENE-HOLOCENE
HAWTHORN GROUP
OCALA GROUP
Moderate brown to moderate yellowish-brown clayey, organic quartz sand. with chert fragments.
Dark yellowish-brown clayey, organic quartz sand.
Dark yellowish-brown sandy, organic clay with chert fragments.
Dark yellowish-brown clayey quartz sand.
Light olive-gray clayey, organic quartz sand.
Grayish-brown sandy, organic-rich clay.
Light olive-gray clayey, dolomitic, phosphatic quartz sand.
Grayish-brown to yellowish-gray clayey, organic-rich quartz sand
Very light-orange fossiliferous limestone.
T.D.=36.5 FEET.

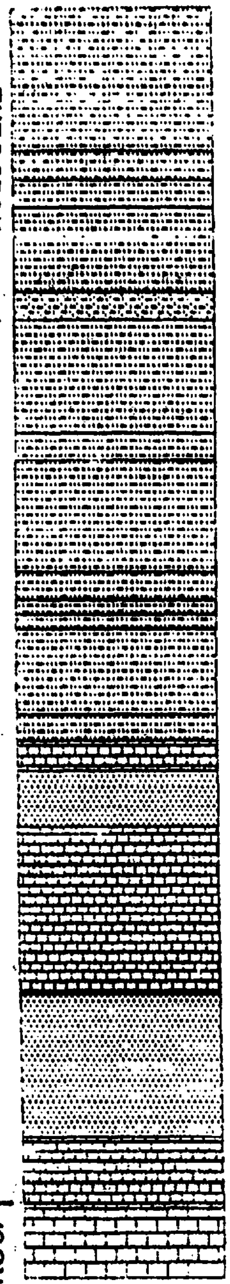
Figure 5: Columnar section for well #3 (W-16200).

DEPTH (FEET MSL)

W–16200

T.07S R.18E S.27 A ALACHUA COUNTY

ELEVATION=160 FEET (MSL)



DEPTH	UNIT	DESCRIPTION
0–10	UNDIFFERENTIATED PLEISTOCENE–HOLOCENE	Pinkish-gray to dark yellowish-orange clayey, organic quartz sand.
10		Very light-orange clayey quartz sand.
		Yellowish-gray to light yellowish orange clayey, organic quartz sand.
		Yellowish-gray to light yellowish-orange clayey quartz sand.
20		Light greenish-yellow sandy, phosphatic clay.
	HAWTHORN GROUP	Grayish-brown to yellowish-gray clayey quartz sand.
30		Very light-orange to white clayey, phosphatic quartz sand.
		Grayish-brown to yellowish-gray clayey quartz sand.
40		Very light-orange to white clayey, phosphatic quartz sand.
		Grayish brown to dark yellowish-orange clayey quartz sand with silica cement.
		Yellowish-gray to light olive clayey, phosphatic quartz sand with limestone fragments.
		Yellowish-gray to light-olive clayey, phosphatic quartz sand with clay and limestone fragments.
50		Very light-orange clayey quartz sand.
		White sandy calcilutite.
		White to dark yellowish-orange sandy, phosphatic calcilutite.
		Yellowish-gray calcareous, phosphatic quartz sand.
60		Yellowish-gray sandy, phosphatic calcilutite.
70		Yellowish-gray to moderate yellowish-brown calcareous, phosphatic quartz sand.
80		Yellowish-gray sandy, phosphatic calcilutite.
90	OCALA GROUP	Yellowish-gray to white fossiliferous limestone.
		T.D.=90 FEET.

Undifferentiated Hawthorn Group sediments occurred from 22 to 90 feet bls. The upper portion of this section, from 22 to 52.5 feet bls, was largely clay, phosphatic quartz sands, with occasional interbedded clays. Some of these sediments may represent reworked Hawthorn Group deposits. A series of sandy, unfossiliferous carbonates, containing interbedded sands, extends from 52.5 to 90 feet bls. Although permeameter testing was not performed on sediments in this interval, visual examination of the calcareous units indicates these sediments probably have relatively high permeabilities; they may locally serve as units of the intermediate aquifer system.

Six split-spoon samples were recovered in Well No. 3, spanning the interval from 10.5 to 52 feet bls. The uppermost samples (10.5 to 12.5 feet bls and 20.5 to 22.5 feet bls) were taken in the undifferentiated Pleistocene-Holocene section, and have very low hydraulic conductivities of 10^{-8}cm/s (see Table 4). Both intervals contain abundant silt and clay fractions. The interval from 10.5 to 12.5 feet bls is almost 40 percent silt and clay (Table 5), with the clays comprised largely of smectite and palygorskite. In the interval 20.5 to 22.5 feet bls, silt and clay combined from over 48 percent of the sample. Smectite is the dominant clay present. The four deeper split-spoon samples were situated in the clayey, phosphatic sands of the Hawthorn Group. These displayed a range of hydraulic conductivity values. The 30.5 to 32.5 feet bls interval tested at a value of 10^{-7}cm/s. Although this interval contains less than 20 percent combined silt and clay, the predominantly smectite clay component effectively seals this phosphatic, quartz sand unit. A moderate conductivity of 10^{-4}cm/s is observed in the 40.5 to 41.5 feet bls interval. This interval is also a phosphatic, clayey quartz sand. Smectite and palygorskite are the most common clays present. The lower portion of this split-spoon sample, comprised of the interval 41.5 to 42.5 feet bls displayed a lower conductivity of 10^{-5}cm/s. Interestingly, the lithology over the entire 40.5 to 42.5 feet bls sample appeared visually to be similar; the order of magnitude difference in conductivity between the upper and lower parts of the same sample underscores the vertical variability in the hydraulic conductivities of these samples.

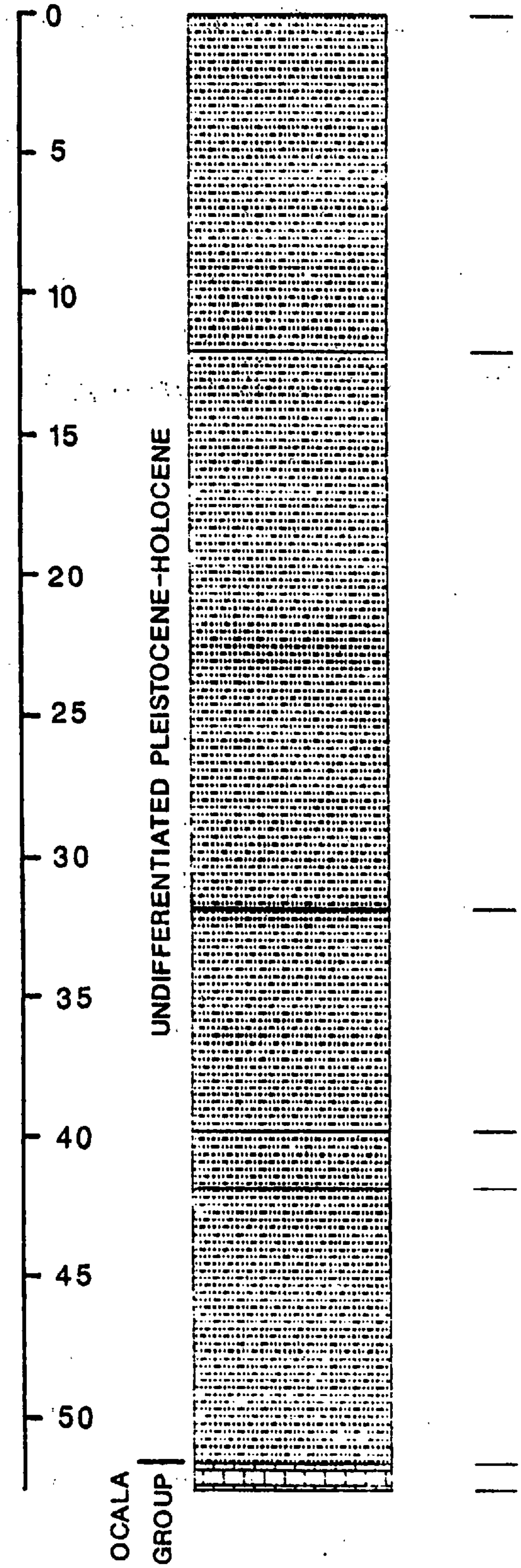
The deepest split-spoon sample covered the depth interval 50.5 to 52.5 feet bls. Lithologically, this interval is quartz sand, with less than 18 percent silt and clay matrix. Smectite is the only clay present in the clay fraction, and quartz is the most common constituent of the bulk sample. Despite the relatively low clay content, the interval tested as a low conductivity of $^{-7}$cm/s.

Well No. 4 (W-16201) is situated two miles west of Alachua, at the westernmost edge of the Northern Highlands zone. It is located in the karst-modified, rolling hills of the perforated aquifer zone (Macesich, 1988). Well No. 4 was drilled to a total depth of 53 feet bls where it penetrated the fossiliferous Crystal River Formation of the Ocala Group. The columnar stratigraphic section is shown in Figure 6. Hawthorn Group sediments were not present in this well. The upper 53 feet of the section consisted of undifferentiated Pleistocene-Holocene clayey, quartz sands. These sediments may consist, at least in part, of reworked Hawthorn

Figure 6: Columnar section for well #4 (W-16201).

DEPTH (FEET MSL) **W-16201** T.08S R.18E S.17 A ALACHUA COUNTY

ELEVATION=115 FEET (MSL)



Moderate yellowish-brown to moderate-brown clayey, phosphatic, organic-rich quartz sand.

Grayish-orange to yellowish-gray clayey, organic-rich quartz sand.

Light-red to light-brown clayey, organic-rich, dolomitic quartz sand.

Very light-orange clayey quartz sand.

Light-brown clayey, calcareous quartz sand.

Very light-orange to white fossiliferous limestone.

T.D.=53 FEET.

Group deposits. Only the interval from 0 - 12.5 feet bls contains phosphatic sands.

Four split-spoon core samples were taken between 10.5 and 52.5 feet bls. All four showed low or very low hydraulic conductivities. The interval 10.5 to 12.5 feet bls consisted of a clayey, phosphatic, and dolomitic quartz sand. Smectite, and trace amounts of kaolinite comprise the clay component. Permeameter testing showed a hydraulic conductivity of only 10^{-7}cm/s (Table 4). Similarly, the next deeper split-spoon interval (30.5 to 32.5 feet bls), a clayey, organic-rich quartz sand also tested at 10^{-7}cm/s. The interval 40.5 to 42.5 feet bls consisted of clayey quartz sand, and exhibited no hydraulic conductivity (no flow) after 21 days on the permeameter. This interval was comprised of about 26 percent combined silt and clay, less than some other more permeable samples studied during this project. The last split-spoon sample interval (50.5 to 52.5 feet bls) contained a phosphatic, clayey, calcareous, quartz sand. Phosphate is the most common mineral in both the bulk and clay fraction x-ray analyses. This interval tested at 10^{-7}cm/s hydraulic conductivity, similar to values obtained up-core.

Well No. 5 (W-16202) was drilled in extreme northwestern Alachua County, about one and a half miles west of the community of Bland. This well is situated in the Northern Highlands geomorphic zone (White, 1970), and in the perforated aquifer zone (Macesich, 1988). The topography surrounding the well site have been modified by numerous karst depressions and Hawthorn Group sands are exposed in nearby creek banks. Well No. 5 encountered

Ocala Group limestone at a depth of 94 feet bls. Figure 7 shows the columnar section for this well. Seventy-four feet of undifferentiated Hawthorn Group clayey, phosphatic quartz sands and sandy clays were penetrated from 20 to 94 feet bls. The upper 20 feet of the well consists of undifferentiated Pleistocene-Holocene quartz sand and clay. Quartz and phosphate are the most abundant minerals throughout the entire section (Table 6).

Eight split-spoon cores were taken between 10.5 and 91 feet bls. The shallowest interval sampled (10.5 to 12.5 feet bls) was in the undifferentiated Pleistocene-Holocene section. Lithologically, this interval is comprised of a sandy, phosphatic, organic-rich clay, with a hydraulic conductivity of 10^{-7}cm/s (Table 7). The three uppermost Hawthorn Group samples (20.5 to 22.5, 30.5 to 31.0, and 43.5 to 45.0 feet bls), which consist of clayey, phosphatic quartz sands and sandy, phosphatic clays, had relative conductivities of 10^{-8}, 10^{-7}, and 10^{-7}cm/s respectively. No hydraulic conductivity was observed in split-spoon interval 50.5 to 52.5 feet bls, which is a dolomitic and phosphatic, slightly clayey quartz sand. The lower three split-spoon cores, 60.5 to 62.5, 82.5 to 87.5, and 90.5 to 91.0 feet bls, showed downward-increasing hydraulic conductivities of 10^{-8}, 10^{-7}, 10^{-6}cm/s respectively. These sediments are largely phosphatic, clayey and dolomitic quartz sands.

Well No. 6 (W-16203) is located at the northern edge of Paynes Prairie, one half mile west of Alachua Sink. Paynes Prairie is part of the Alachua Lake Cross Valley, a lowlands physiographic zone of white (1970). The prairie terrain is flat and karstic, and

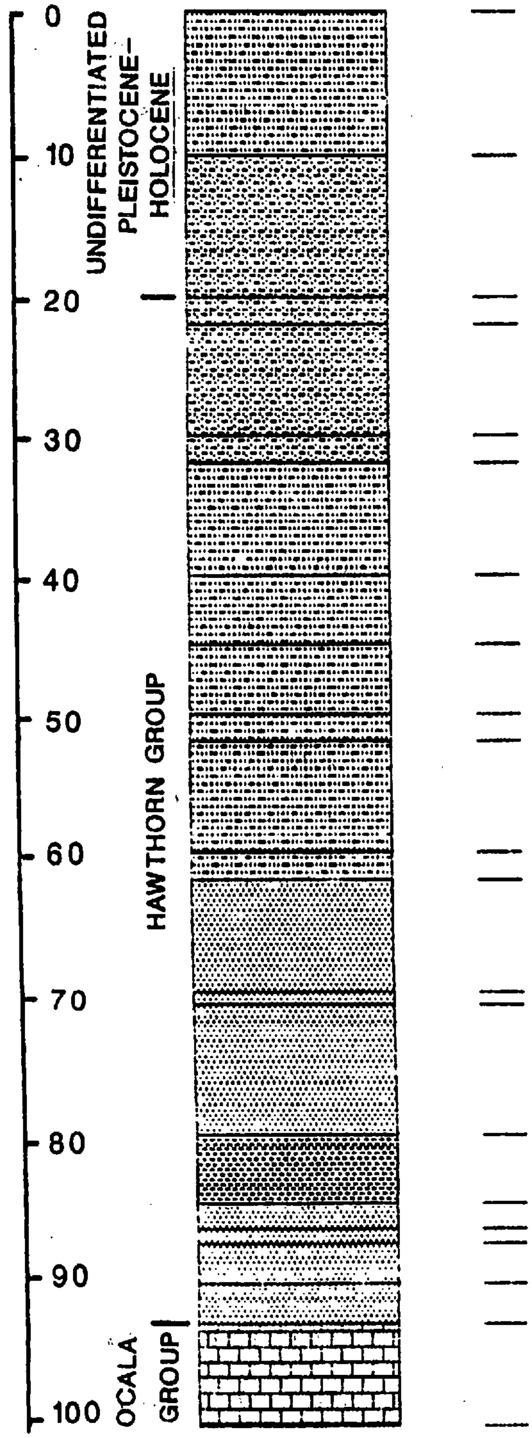
Figure 7: Columnar section for well #5 (W-16202).

DEPTH (FEET MSL)

W-16202

ELEVATION=140 FEET (MSL)

T.07S R.18E S.05 B ALACHUA COUNTY



Yellowish-gray to moderate yellowish-brown clayey quartz sand with plant remains.

Yellowish-gray to dark yellowish-orange sandy clay with plant remains.

Dark grayish-yellow sandy, phosphatic clay.

Yellowish-gray to grayish orange sandy clay.

White to dark yellowish-orange sandy, phosphatic clay.

Grayish-brown clayey, phosphatic quartz sand.

Grayish-yellow clayey, phosphatic quartz sand.

Yellowish-gray to moderate yellowish-brown clayey quartz sand.

Grayish-yellow clayey quartz sand.

Grayish-brown clayey quartz sand.

Very light-orange clayey, phosphatic quartz sand.

Grayish-brown to white calcareous, phosphatic quartz sand.

White calcareous, phosphatic quartz sand.

Grayish-orange-pink to dark yellowish-orange calcareous, phosphatic quartz sand.

Light greenish-yellow clay with limestone fragments.

Very light-orange calcareous, phosphatic quartz sand.

Yellowish-gray calcareous, phosphatic quartz sand with bryozoan fossils.

Very light-orange calcareous, phosphatic quartz sand.

Pinkish-gray calcareous quartz sand with chert fragments.

Very light-orange fossiliferous limestone.

T.D.=101 FEET.

is situated in the perforated aquifer zone (Macesich, 1988). Ocala Group limestone is near the surface, covered only by a thin veneer of Hawthorn Group and undifferentiated Pleistocene-Holocene deposits. A columnar stratigraphic section for Well No. 6 is illustrated in Figure 8. The top of the Ocala Group was penetrated at the well's total depth of 30 feet (bls). This limestone is overlain by 10 feet of sandy, phosphatic clay and clayey sand of the Hawthorn Group. The Hawthorn is in turn overlain by 20 feet of undifferentiated Pleistocene-Holocene clayey, peaty, quartz sands.

Two split-spoon cores were taken in Well No. 6 covering the depth intervals 10.5 to 12.5 and 20 to 22 feet bls. The shallower interval lies in the undifferentiated Pleistocene-Holocene section, and was comprised of clayey, dolomitic, quartz sand and sandy, kaolinite-rich clay. Permeameter analysis of this interval shows a low hydraulic conductivity of 10^{-7} cm/s, reflecting the low permeability of the clay matrix. The 20 to 22 feet bls interval is situated in the top of the Hawthorn Group sediments. This interval consisted of a quartz sandy, phosphatic clay. Phosphate and quartz are the most common minerals present, and the clay fraction is comprised of francolite and trace amounts of kaolinite (Tables 6 and 7). This interval showed very low hydraulic conductivity, with no flow in the permeameter after 21 days of testing.

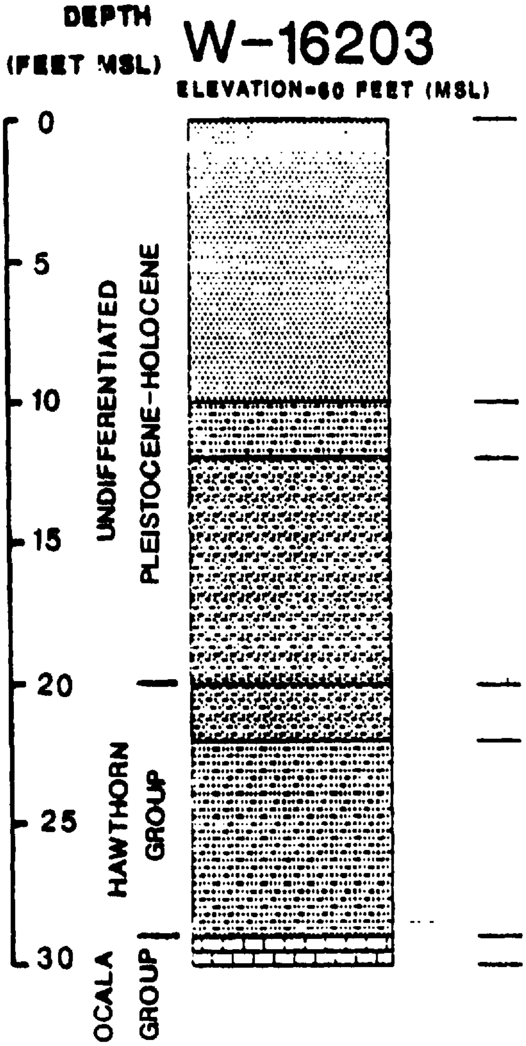
Well No. 7 (W-16204) is situated on the man-made levee crossing north-central Paynes Prairie, about one and a half miles east of Rocky Point. This well was drilled to a total depth of 42

Figure 8: Columnar section for well #6 (W-16203).

W-16203

T.10S R.20E S.21 B ALACHUA COUNT

ELEVATION=60 FEET (MSL)



Light-brown organic-rich quartz sand.

Grayish-brown clayey quartz sand.

Grayish-orange-pink sandy, organic-rich clay.

Light-olive to light brown sandy, phosphatic clay.

Grayish-brown to light brown clayey quartz sand.

Very light-orange to yellowish gray fossiliferous limestone.

T.D.=30 FEET.

feet bls, and penetrated the Ocala Group at 40 feet bls. Figure 9 shows the columnar section for this well. The interval from 0 to 32 feet bls is tentatively placed in the category of undifferentiated Pleistocene-Holocene section due primarily to the abundance of organics and Holocene freshwater gastropod shells in many of the samples. Phosphatic sand, probably reworked from Hawthorn Group sediments, is present in the interval from 10 to 12 feet bls.

Four split-spoon cores were recovered from the intervals 10 to 12, 20, 20 to 22, and 30 to 32 feet bls. Permeameter tests were not performed on the 10 to 12 or the 20 feet bls intervals, both phosphatic, calcareous, quartz sandy clays, because they were either too badly grooved by the core catcher or too unconsolidated to seal in the permeameter. The interval 20 to 22 feet bls is a calcareous, quartz sandy clay with a very low hydraulic conductivity of 10^{-8} cm/s (Table 4). Calcite and aragonite are the most abundant minerals, with trace quantities of palygorskite clay also present. The presence of freshwater gastropods (*Helisoma* sp.) suggests a fluvial or lacustrine origin for these sediments. Split-spoon sample interval 30 to 32 feet bls consisted of a sandy, clayey, organic-rich limestone at the base of the Hawthorn Group section. Hydraulic conductivity was tested at 10^{-7} cm/s, a low value probably due in part to the kaolinite clay content of the sample.

Well No. 8 (W-16205) is located at the southern edge of Paynes Prairie, about two and a half miles northwest of Micanopy. The well site was situated on a small remnant highland, surrounded by

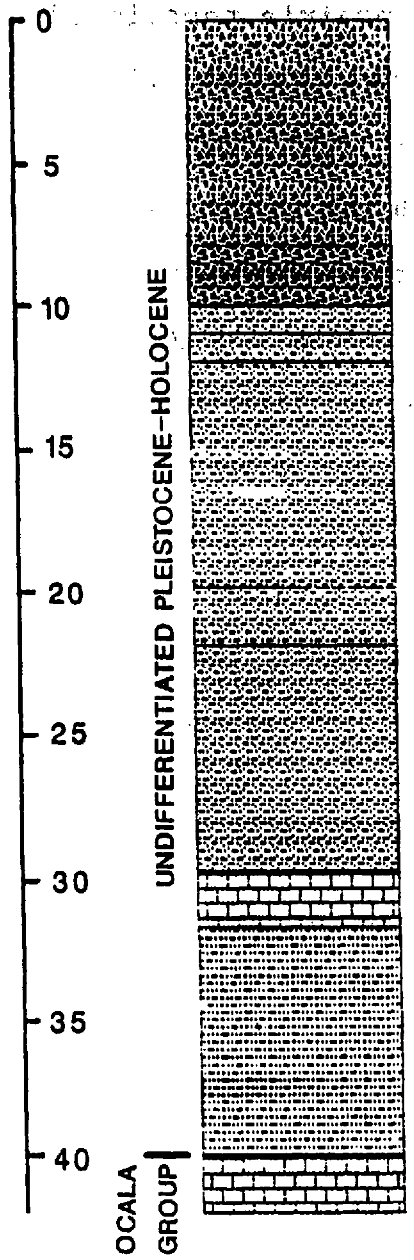
Figure 9: Columnar section for well #7 (W-16204).

DEPTH (FEET MSL)

W–16204

T.10S R.20E S.28 ALACHUA COUNTY

ELEVATION=60 FEET (MSL)



Dark gray to yellowish-gray sandy peat.

Yellowish-gray calcareous, sandy, phosphatic clay.

Dark-brown calcareous, sandy phosphatic clay.

Dark yellowish-brown to dark-brown sandy, calcareous clay with freshwater gastropods.

Dark yellowish-brown calcareous, sandy clay with freshwater mollusk fragments.

Moderate gray to black organic-rich clay with mollusk shell fragments.

Dark yellowish-brown to black clayey, sandy, organic-rich limestone.

Black to moderate-gray clayey quartz sand with plant remains and limestone. and Eocene fossils.

Light gray fossiliferous limestone.

T.D.=42 FEET.

the otherwise flat, swampy, and highly karstic prairie terrain of the Alachua Lake Cross Valley geomorphic zone (White, 1970). Figure 10 illustrates the stratigraphic section penetrated by the well. The well did not reach the top of the Ocala Group, ending instead in a moderately-indurated Hawthorn Group cemented sand. Much of the well section was composed of interbedded sandy clays and clayey sands, making an accurate formational pick somewhat subjective. The top of the Hawthorn Group was placed at 40 feet bls, where phosphatic sand first appears downhole, and where organic remains cease to be an accessory constituent of the samples. Overlying the Hawthorn Group, in the interval from 0 to 40 feet (bls), are a series of clayey sands and sandy clays containing plant remains. These sediments are considered to be undifferentiated, Pleistocene-Holocene section.

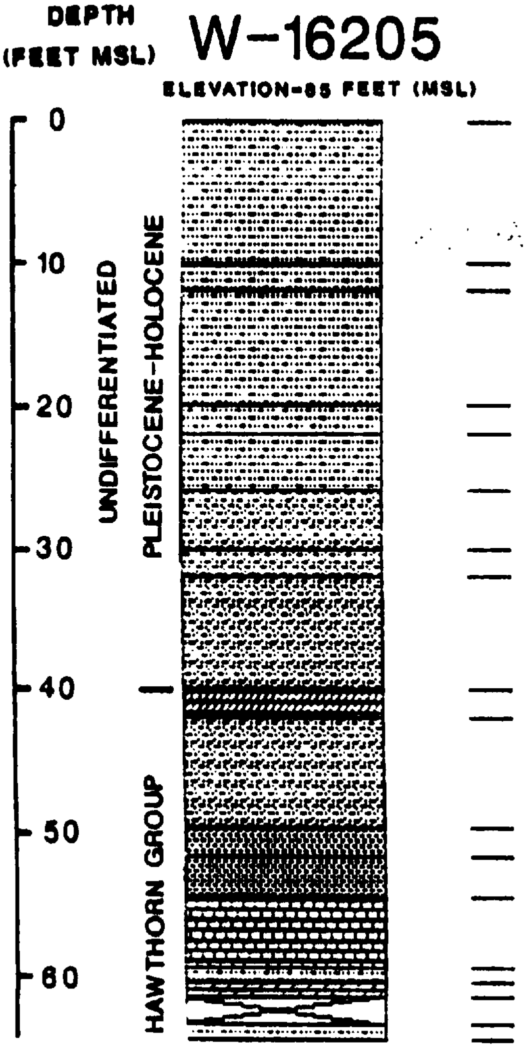
Seven split-spoon cores were recovered between 10 and 62 feet bls. One interval, 30 to 32 feet bls, could not be tested for conductivity because it was scored by the core-catcher teeth and would not seal in the permeameter. The shallowest intervals, 10 to 12 and 20 to 22 feet bls, are part of the undifferentiated Pleistocene-Holocene age section. Both intervals are clayey sands, showing moderately low hydraulic conductivities of 10^{-6}cm/s (Table 4). Quartz is the most abundant mineral in the bulk sample and kaolinite and palygorskite comprise the clay fraction in the 10 to 12 feet bls interval. Quartz, francolite, and wavelite are the abundant mineral components of the 20 to 22 feet bls interval. The phosphate may be derived from reworked Hawthorn Group sediments. Four of the split-spoon cores were taken in the Hawthorn Group.

Figure 10: Columnar section for well #8 (W-16205).

W-16205

T.11S R.20E S.03 ALACHUA COUNTY

ELEVATION-65 FEET (MSL)



Moderate yellowish-brown clayey, organic-rich quartz sand.

Yellowish-gray to grayish-brown clayey quartz sand.

Gray ish-brown clayey, organic-rich quartz sand.

Very light-gray to yellowish-gray clayey quartz sand.

Grayish-brown clayey, organic-rich sand.

Dark yellowish-orange to grayish brown sandy, organic-rich clay;

Light blue-green sandy clay.

Grayish-brown to dark yellowish-orange sandy clay.

Yellowish-gray sandy, clayey, phosphatic dolosilt.

Grayish-brown sandy clay.

Light olive dolomitic, phosphatic clay.

Grayish-brown sandy clay.

Yellowish-gray sandy, phosphatic calcilutite.

Yellowish-gray to moderate yellowish-brown clayey, phosphatic quartz sand.

White to very light gray clayey, phosphatic, sandy dolomite.

No samples

Moderate orange-pink clayey quartz sand.

T.D.-65 FEET.

The intervals 40 to 42 feet bls and 50 to 52 feet bls are quartz-sandy, phosphatic, dolomitic clays. Both did not flow in the permeameter tests, indicating extremely low hydraulic conductivities. The clay fraction of the 40 to 42 feet bls split-spoon core is predominantly smectite and dolomite; in the 50 to 52 feet sample, palygorskite, smectite, and quartz are the most abundant minerals comprising the clay (Table 7). Split-spoon samples taken in the last five feet of the well (60 to 61.5 and 61.5 to 62 feet bls) showed moderately low hydraulic conductivities of 10^{-5} and 10^{-6} respectively (Table 4). The 60 to 61.5 feet bls interval is a clayey, phosphatic, dolomitic quartz sand. Clay comprises 9 percent of the sample. Between 61.5 and 62 feet bls, the lithology is a sandy, clayey, phosphatic dolomite. The small clay fraction in this interval is comprised of quartz and francolite (Table 7).

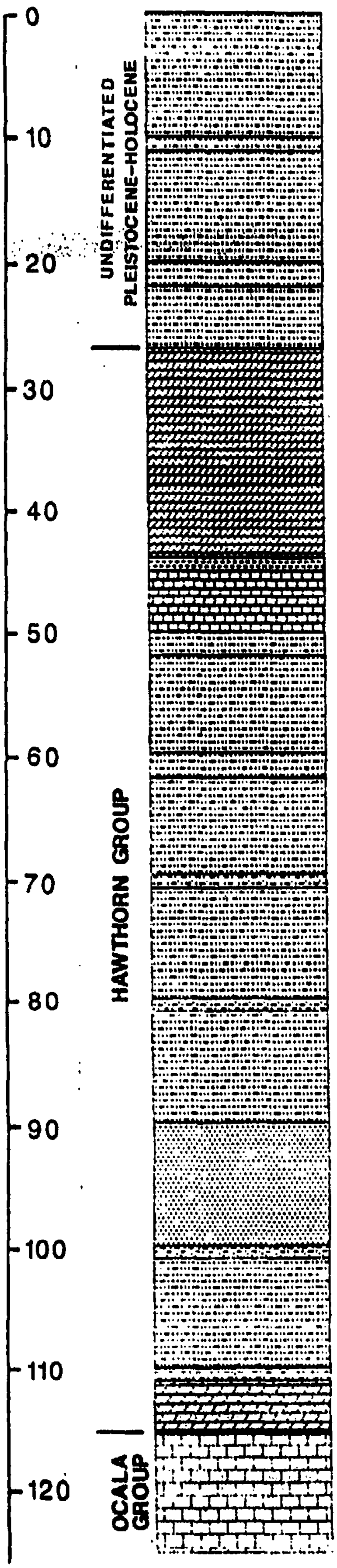
Well No. 9 (W-16206) is situated in the confined aquifer zone (Macesich, 1988) in section 6, T9S, R20E, five miles north of Gainesville. In this area of the Northern Highlands, the surrounding topography is comprised of flat, swampy bays punctuated by gently rolling hills. This well penetrated the Ocala Group at approximately 120 feet bls, and ended at a total depth of 125 feet bls. Figure 11 illustrates the stratigraphic section obtains in this well. The Hawthorn Group is comprised of a series of interbedded, phosphatic dolosilts, sandy clays, and clayey sands, spanning the depth interval between 27 and 120 feet bls. Overlying the Hawthorn Group is a typical sequence of undifferentiated Pleistocene-Holocene, iron-stained, clayey, organic-rich quartz

Figure 11: Columnar section for well #9 (W-16206).

DEPTH (FEET MSL) **W-16206**

ELEVATION-175 FEET (MSL)

T.09S R.20E S.06 ALACHUA COUNTY



Grayish-brown to moderate reddish-orange clayey, organic, quartz sand.

Light olive-gray clayey quartz sand.

Grayish-brown clayey, organic quartz sand.

Light olive-gray clayey quartz sand.

Grayish brown to moderate yellowish-brown clayey, phosphatic quartz sand.

Grayish brown to yellowish-gray sandy, clayey, phosphatic dolosilt.

Light olive-gray to yellowish gray sandy, dolomitic clay.

Light olive-gray sandy, clayey, phosphatic calcilutite.

Yellowish-gray clayey, phosphatic, dolomitic quartz sand.

Olive-gray clayey, phosphatic quartz sand with chert fragments.

Light olive-gray clayey, phosphatic quartz sand

Olive-gray to light olive gray clayey, phosphatic quartz sand.

Grayish orange to moderate yellowish-brown sandy, phosphatic clay.

Olive gray clayey, calcilutitic, phosphatic quartz sand.

Olive-gray sandy clay.

Grayish-brown calcilutitic, clayey, phosphatic quartz sand.

Yellowish-gray calcilutitic, phosphatic quartz sand with limestone fragments.

Dark greenish-gray calcilutitic, sandy clay.

Dark yellowish-brown clayey, phosphatic quartz sand with limestone fragments.

Very light-orange to light olive-gray sandy, calcilutitic, phosphatic clay.

Grayish-brown sandy, phosphatic dolomite.

Very light-orange fossiliferous calcilutite.

(T.D.-125 FEET)

sands.

Ten split-spoon cores were taken between 10 and 111 feet bls. The two uppermost sample intervals (10 to 12 and 20 to 22 feet bls) are situated in the undifferentiated Pleistocene-Holocene section and display significantly different hydraulic conductivities. Between 10 and 12 feet bls, the lithology is a slightly clayey, (kaolinite) quartz sand, with a moderately low conductivity of 10^{-4} cm/s (Table 4). Combined silt- and clay-size components comprise about 22 percent of the sample. The 20 to 22 feet bls interval also contains clayey quartz sand and sandy clay, but tested at a much lower hydraulic conductivity of 10^{-8} cm/s. This lower permeability most likely results from the higher fines fractions of the 20 to 22 feet sample, which contains over 52 percent combined silt and clay. The eight deeper split-spoon cores are from the Hawthorn Group section in the well. Cores taken in the upper part of the Hawthorn Group (30 to 32, 43 to 45 and 50 to 52 feet bls) show a trend of decreasing hydraulic conductivity with depth, with values of 10^{-6}, 10^{-7}, and 10^{-8} cm/s respectively. The 30 to 32 and 43 to 45 feet bls intervals are quartz sandy dolosilts. Dolomite, quartz, and francolite are the dominant minerals present (Table 6). In the 30 to 32 feet bls sample kaolinite and palygorskite comprise most of the clay fraction, while in the interval 43 to 45 feet bls, quartz and smectite are the major clay components. The interval from 50 to 52 feet bls is a clayey, phosphatic, dolomitic quartz sand. Clay and silt combined comprise 32 percent of this sample. Sediments in the split-spoon core interval from 60 to 62 feet bls were over 80 percent quartz sand,

and too unconsolidated to test in the permeameter. The last four split-spoon cores, spanning the intervals 70 to 71, 80 to 81, 100 to 101, and 100 to 111 feet bls, did not flow in the permeameter tests, indicating very low hydraulic conductivities. These intervals are, for the most part, sandy, phosphatic, dolomitic clays. Dominant clay minerals in the samples were smectite and palygorskite (Table 7). The interval from 70 to 71 feet bls also contained quartz and dolomite in the clay fraction. The interval from 110 to 111 contained substantial quartz in the clay.

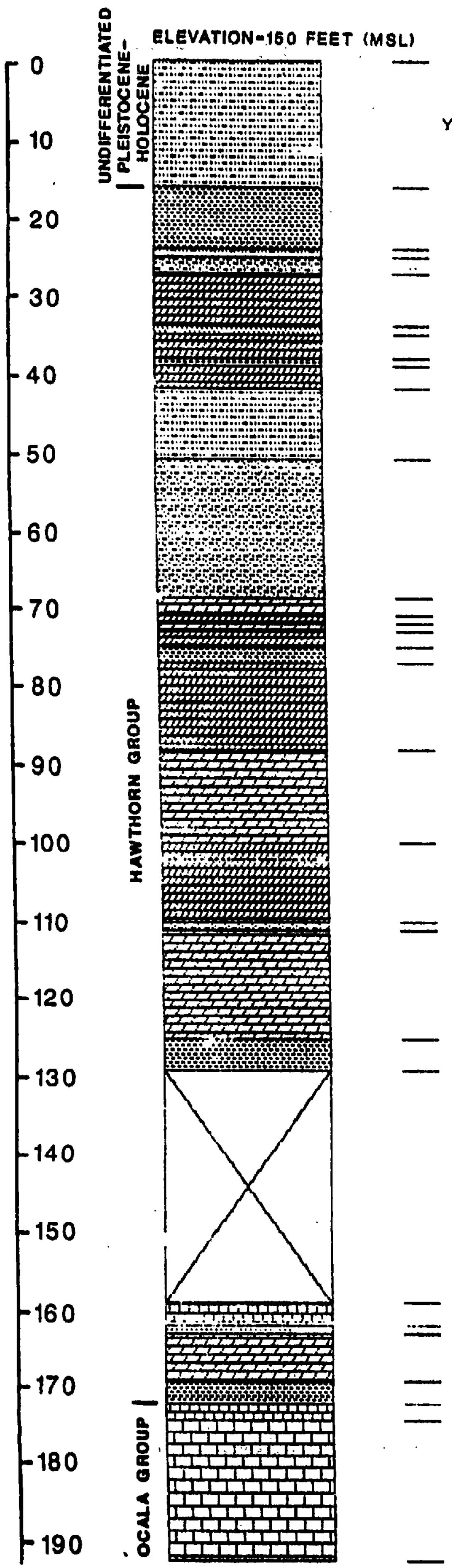
Well No. 10 (W-16207) is a continuous two-inch core located in the Austin Cary Memorial Forest. The detailed columnar stratigraphic section is illustrated in Figure 12. This well was drilled to a total depth of 191 feet bls, and bottomed in limestone of the Ocala Group. Appendix I provides a detailed lithologic log for this well. The Crystal River Formation, the uppermost formation of both the Ocala Group and the Floridan aquifer system, was penetrated at a depth of 173.7 feet bls. Unconformably overlying the Ocala Group are three recognizable formations of the Hawthorn Group. In ascending order these are the Penney Farms Formation (94 to 137.7 feet bls), the Markshead Formation (69 to 94 feet bls), and the Coosawhatchie Formation (16.2 to 69 feet bls), with the Charlton Member of the Coosawhatchie Formation in the interval 16.5 to 24.2 feet bls. The Hawthorn Group is in turn overlain by a thin veneer of clayey, organic-rich, undifferentiated Pleistocene to Holocene undifferentiated quartz sands.

Six split-spoon core samples were recovered during the drilling for permeameter analyses (Table 4). Three of these cores

Figure 12: Columnar section for well #10 (W-16207).

DEPTH (FEET MSL) **W-16207** T.09S R.21E S.04 ALACHUA COUNTY

ELEVATION=160 FEET (MSL)



Yellowish-gray to grayish-brown clayey, organic quartz samd

Greenish-gray to light grayish green clay.

White to very light-gray clayey quartz sand.

Grayish-green to light grayish-green clay.

Yellowish-gray to grayish-green sandy, phosphatic clay with shark teeth, mollusks, and dolosilt.

Yellowish-gray to grayish yellow clayey, dolomitic, phosphatic quartz sand.

Yellowish-gray sandy, clayey, phosphatic dolosilt.

Light grayish-green to grayish-green phosphatic, dolomitic clay.

Yellowish-gray sandy, phosphatic dolosilt.

Very light-orange to yellowish gray dolomitic, phosphatic quartz sand.

Light olive-gray to moderate olive brown sandy, phosphatic clay with shark teeth.

White to very light-gray sandy, phosphatic dolomite.

Light olive-gray sandy, phosphatic dolosilt.

Very light gray to white phosphatic dolomite.

Light grayish-green to light greenish-gray phosphatic dolosilt.

Light olive-gray to light greenish-yellow clay.

Light olive-gray to grayish green phosphatic dolosilt.

Very light-gray to white phosphatic, fossilliferous dolomite.

Yellowish-gray to very dark-purple sandy, phosphatic, fossiliferous dolosilt.

Moderate light-gray to moderate dark gray sandy, phosphatic clay.

Very light-gray to light gray sandy, phosphatic dolomite.

White to very light gray clay.

No Samples

White to very light gray sandy, phosphatic calcilutite.

Yellowish gray to light olive-gray dolomitic, phosphatic quartz sand.

Very light gray to yellowish gray sandy, phosphatic dolomite.

Very light-gray to yellowish-gray dolomitic clay with interbedded micrite.

Yellowish-gray to white sandy, phosphatic calcilutite.

White to light olive-gray fossiliferous limestone.

T.D.=191 FEET.

(10 to 11 feet bls, 58 to 60 feet bls, and 67.5 to 68 feet bls) were either grooved by the core-catcher of had shrunken inside the plastic core tube and would not seal in the permeameter. The useable cores included the depth intervals 10 to 11 feet bls, 36 to 37 feet bls, and 47 to 49 feet bls. The shallowest split-spoon sample (10 to 11 feet bls) showed a moderately-low hydraulic conductivity of 10^{-5} cm/s (See Table 4). This interval is in the surficial aquifer system, and is predominantly sand with approximately 18 percent kaolinite and palygorskite clays (Table 5 and 7). The two deeper split-spoon intervals are in the intermediate aquifer system and were both taken in the Coosawhatchie Formation of the Hawthorn Group. Both show relatively low hydraulic conductivities of 10^{-7} cm/s (Table 4). The 35.9 to 37 feet bls interval is a yellowish gray dolosilt, a lithology common to the Hawthorn Group. Dominant minerals in this interval include smectite and dolomite, with traces of kaolinite and francolite (Table 7). The deepest usable split-spoon interval (45.1 to 49 feet bls) is largely comprised of clayey, dolomitic quartz sand. Both the clay and dolomite components of the matrix undoubtedly contribute to the lower permeability of this interval.

The x-ray analysis of Well No. 10 show a mineral distribution pattern which correlates closely with the stratigraphy (Tables 6 and 7). Quartz is the most common mineral in the undifferentiated Pleistocene-Holocene and in the uppermost Charlton Member of the Coosawhatchie Formation. This quartz is present as sand-size, silt-size, and clay size particles. The clays in the upper 42 feet of the core are predominantly kaolinite and smectite. Below 42 feet, and through most of the Hawthorn Group, quartz, dolomite, and francolite are the most common minerals in the bulk samples. Palygorskite, quartz, and dolomite are the dominant constituents of the clay fractions. Occasional occurrences of aragonite and calcite appear to correlate with the limestone or calcareous sand intervals within the Hawthorn Group. As would be expected, calcite is the dominant mineral present in the top of the Ocala Group limestone.

SUMMARY AND CONCLUSIONS

The information obtained in this study indicates considerable variation, both vertically and laterally, in the hydrogeologic nature of the sediments overlying the Floridan aquifer system in Alachua County. At the same time, certain commonalities exist locally between some of the parameters studied during this project. Unfortunately, a detailed analysis of the lateral continuity of many of the hydrogeologic datums observed in individual wells is precluded by the limited scope of this project. To accurately correlate zones of very low hydraulic conductivity or of particular mineralogic composition, if even possible, would require a more extensive well grid than current funds and time allow. However, several conclusions may be made out of the present study. These are outlined in the following section.

1. The lithologies of the sediments overlying the Floridan aquifer system in Alachua County, in general, range from sandy clays and clayey sands, containing variable amounts of phosphatic sand and gravel, to sandy, phosphatic dolomites and limestones. The intermediate aquifer system and associated confining units,

comprised of Miocene-age Hawthorn Group sediments, is a series of interbedded lithologies. These lithologies vary from clayey, generally phosphatic sands and sandy, phosphatic clays at the top of the section, to sandy, phosphatic calcarenitic limestone or dolomite near the base of the section. Thickness of the Hawthorn Group sediments varies from 0 in western Alachua County to nearly 160 feet in the northeastern part of the county. The undifferentiated Pleistocene-Holocene age section is predominantly clayey quartz sand. It frequently contains organics and reworked phosphate. This section comprises the surficial aquifer system in Alachua County and varies between 15 and 60 feet thick.

2. Grain size analyses of selected samples from the split-spoon cores reveals no significant trends. For both the undifferentiated Pleistocene-Holocene and the Hawthorn Group sections, the quartz sand content (weight percent greater than 4 phi size) ranged from a minimum of 47.91 percent to a maximum of 94.62 over the entire sample set. Most individual samples contained a sand size range of very fine to coarse, with modes of either fine or medium size. Graded bedding was not apparent. Silt content ranged from a low of 1.65 percent to a high of 22.11 percent. Clay content ranged from a minimum of 1.58 weight percent to a maximum of 36.96 percent. In general, those samples with high silt and clay components showed the lowest permeabilities (low hydraulic conductivities). Vertical distribution of the high-clay content intervals showed no apparent pattern, in either the undifferentiated intervals or Hawthorn Group.

3. X-ray analysis of selected samples in the ten study wells

reveals that quartz is the most abundant mineral present. It occurs as either the only mineral or as one of the most abundant minerals in 88 percent of the bulk samples tested. Most of these samples are from intervals containing abundant quartz sand. Calcite occurs in 17 percent of the samples, usually as a calcilute matrix component of sand, clay, or dolosilt, or in fragments of freshwater gastropod shells found in some of the undifferentiated Pleistocene-Holocene deposits. Some of the calcite in the Hawthorn Group sands and clays may be derived from the reworking of subadjacent calcareous units. Calcite is more prevalent in wells 7 through 10, taken in Paynes Prairie and eastern Alachua County. Aragonite occurred in nine samples, in a pattern similar to that of calcite. Dolomite is a common constituent of the dolosilt and dolomitic clay intervals in wells 8, 9, and 10. It is restricted to the Hawthorn Group sediments, not occurring in any of the undifferentiated Pleistocene-Holocene interval samples. Francolite (phosphate) is a common constituent of the Hawthorn Group sediments. In most of the wells, phosphatic sands and gravels also occur in the undifferentiated Pleistocene-Holocene section, where they may occur as reworked deposits. These phosphatic, undifferentiated intervals may also correspond to what was once informally called the Alachua Formation. The only well in which phosphate is conspicuously absent is Well No. 1, from the Kanapaha Prairie.

4. Kaolinite, palygorskite, and smectite are the common clay minerals occurring in the split-spoon samples. Smectite and palygorskite tend to commonly occur together in the Hawthorn Group

sediments. In contrast, a smectite-kaolinite clay assemblage, with occasional occurrences of palygorskite, tends to characterize the undifferentiated sediments and the upper part of the Coosawhatchie Formation. Palygorskite and dolomite comprise the major clay constituents of the Markshead and Penney Farms Formations in Well No. 10.

5. The coefficient of hydraulic conductivity (K) values of the sediments overlying the Floridan aquifer system in Alachua County range from an undetermined low of less than 10^{-8} cm/s (samples showed no water flow after 21 days on the permeameter) to a high of 10^{-4} cm/s. A very low K value of 10^{-8} cm/s was the minimum calculated conductivity for samples that flowed within the allotted time. Both the Hawthorn Group sediments and the overlying undifferentiated Pleistocene-Holocene sediments show a similar range of K values. The highest hydraulic conductivities observed (10^{-4} cm/s) occurred in two samples. One is in Well No. 3, located north of Alachua, at a depth of 40.5 to 41.5 feet bls in a clayey, phosphatic sand in the Hawthorn Group. The second is in the depth interval 10.0 to 12.0 feet bls, also a clayey sand, in the undifferentiated Pleistocene-Holocene section of Well No. 9 situated north of Gainesville. Zones of very low permeability were observed in both Hawthorn Group and undifferentiated Pleistocene-Holocene sediments. Samples which did not flow on the permeameter ranged lithologically from clayey, dolomitic sands to dolosilts and sandy, calcareous, phosphatic clays. Other samples, which tested at low K values of 10^{-6} to 10^{-8} cm/s, were predominantly dolosilts, clayey quartz sands, and sandy clays. Moderately low K values of

10^{-4} and 10^{-5} cm/s were obtained from clayey sands with generally lower clay percentages than the low conductivity samples discussed above. The range of low hydraulic conductivity values obtained from the Alachua County sediments would indicate that all the intervals tested are poor aquifers. Some probably function as confining units. Among the 10 well sites analyzed, there is no apparent areal pattern to the distribution of low conductivity zones. Samples selected for analysis were generally sediments with high clay content. There is apparently considerable vertical variation in permeability, and it is most certainly related to lithology. One interesting example of this variability occurs in the near-surface, undifferentiated Pleistocene-Holocene section of Well No. 1. Here the hydraulic conductivity tested at a very low 10^{-8} cm/s, which is significantly less permeable than many intervals tested in the Hawthorn Group to the east. The cause of this very low permeability is undoubtedly the presence of tight clays in the otherwise sandy section. A future continuation of this study should include more samples from easternmost Alachua County to help determine the extent to which the clay content influences the permeability of the undifferentiated Pleistocene-Holocene sands. Unfortunately, all lithologies in a given well could not be tested for permeability, and some strata, particularly carbonate units, may have much higher hydraulic conductivities. Delineation of both vertical and horizontal hydraulic conductivity trends in Alachua County will require a more extensive sample network, and possibly finer resolution in the permeameter sampling interval in each well.

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Appendix I: Lithologic logs for the 10 study cores.

LITHOLOGIC WELL LOG PRINTOUT SOURCE - FGS

WELL NUMBER: W- 16198
TOTAL DEPTH: 00050 FT.
15 SAMPLES FROM 8 TO 50 FT.

COUNTY - ALACHUA
LOCATION: T.11S R.19E S.09
LAT = N 29D 33M 09
LON = W 82D 24M 50

COMPLETION DATE - 07/12/87
OTHER TYPES OF LOGS AVAILABLE - NONE

ELEVATION - 070 FT

OWNER/DRILLER: FLORIDA GEOLOGICAL SURVEY -ALACHUA WELL # 1

WORKED BY: CUTTINGS WORKED BY MIKE WEINBERG, AND SPLIT SPOON SAMPLES WORKED BY THOMAS SEAL, INTERVALS 7.5-12.5, 16-22.5, 27.5-32.5, 37.5-42.5, 45-50 WERE CUTTINGS, REMAINDER WERE SPLIT SPOON SAMPLES; POROSITY ESTIMATED

0.0- 40.5 090UDSC UNDIFFERENTIATED SAND AND CLAY
40.5- 50.0 124OCAL OCALA GROUP

0 - 7.5 SAND; MODERATE BROWN; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED;
ACCESSORY MINERALS: PLANT REMAINS-15%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

7.5- 10 SAND; DARK YELLOWISH BROWN; 15% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO VERY COARSE;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-25%, PLANT REMAINS-10%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

10 - 12.5 CLAY; GREENISH BLACK; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-10%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

12.5- 16 SAND; GRAYISH BROWN; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-05%, PLANT REMAINS-03%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

16 - 18 SAND; GRAYISH BROWN; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): IRON CEMENT, CLAY MATRIX;
ACCESSORY MINERALS: CLAY-05%, IRON STAIN-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

18 - 19 SAND; GRAYISH BROWN TO DARK YELLOWISH BROWN; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): ORGANIC MATRIX, CLAY MATRIX;
ACCESSORY MINERALS: PLANT REMAINS-15%, CLAY-03%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

19 - 20 SAND; GRAYISH BROWN; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-10%, PLANT REMAINS-03%, IRON STAIN-01%;
OTHER FEATURES: UNWASHED SAMPLE, DOLOMITIC;
FOSSILS: NO FOSSILS;

20 - 22.5 SAND; GRAYISH ORANGE; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-15%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

22.5- 27.5 SAND; GRAYISH BROWN TO DARK YELLOWISH BROWN; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, IRON CEMENT;
ACCESSORY MINERALS: CLAY-03%, IRON STAIN-02%, PLANT REMAINS-05%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

27.5- 30.5 SAND; GRAYISH BROWN TO MODERATE YELLOWISH BROWN; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, IRON CEMENT;
ACCESSORY MINERALS: CLAY-05%, IRON STAIN-02%, PLANT REMAINS-03%;
OTHER FEATURES: UNWASHED SAMPLE, DOLOMITIC;
FOSSILS: NO FOSSILS;

30.5- 32.5 SAND; GRAYISH ORANGE; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; UNCONSOLIDATED;
ACCESSORY MINERALS: CLAY-05%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

32.5- 37.5 SAND; GRAYISH BROWN TO VERY LIGHT GRAY; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, IRON CEMENT;
ACCESSORY MINERALS: IRON STAIN-02%, PLANT REMAINS-03%, CLAY-05%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

37.5- 40.5 SAND; GRAYISH BROWN TO DARK YELLOWISH BROWN; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-04%, LIMESTONE-01%, PLANT REMAINS-03%;
OTHER FEATURES: UNWASHED SAMPLE, DOLOMITIC;
FOSSILS: NO FOSSILS;
FIRST OCCURRENCE OF LIMESTONE FRAGMENTS

40.5- 41.5 SAND; YELLOWISH GRAY; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED;
ACCESSORY MINERALS: LIMESTONE-02%, PHOSPHATIC SAND-01%;
OTHER FEATURES: UNWASHED SAMPLE, CALCAREOUS;
FOSSILS: NO FOSSILS;

41.5- 45 SAND; GRAYISH BROWN; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): IRON CEMENT, CLAY MATRIX;
ACCESSORY MINERALS: CHERT-15%, IRON STAIN-05%, CLAY-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: BENTHIC FORAMINIFERA;

45 - 45 LIMESTONE; NO COLOR GIVEN TO LIGHT ORANGISH RED; 0C% POROSITY, POSSIBLY HIGH PERMEABILITY,
, LOW PERMEABILITY;
GRAIN TYPE: , OOLITE;
GRAIN SIZE: VERY COARSE; RANGE: VERY COARSE TO ;
ABUNDANT FRAGMENTS OF BLUE TO WHITE CHERT

45 - 50 CHERT; LIGHT BLUE GREEN TO GRAYISH BROWN; LOW PERMEABILITY; GOOD INDURATION;
CEMENT TYPE(S): SILICIC CEMENT;
ACCESSORY MINERALS: QUARTZ SAND-40%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

50 - 50 LIMESTONE; NO COLOR GIVEN TO LIGHT ORANGISH RED; OC% POROSITY, POSSIBLY HIGH PERMEABILITY,
, LOW PERMEABILITY;
GRAIN TYPE: ;
COLOR OF CHERT BLUE TO GRAY TO WHITE, TEXTURE DULL TO VITREOUS, SAND LIKELY DUE TO CAVING

50 TOTAL DEPTH

LITHOLOGIC WELL LOG PRINTOUT

SOURCE - FGS

WELL NUMBER: W- 16199
TOTAL DEPTH: 036.5 FT.
8 SAMPLES FROM 11 TO 37 FT.

COUNTY - ALACHUA
LOCATION: T.09S R.18E S.35
LAT = N 29D 40M 20
LON = W 82D 29M 12

COMPLETION DATE - 08/12/87
OTHER TYPES OF LOGS AVAILABLE - NONE

ELEVATION - 120 FT

OWNER/DRILLER: FLORIDA GEOLOGICAL SURVEY- ALACHUA WELL # 2

WORKED BY: CUTTINGS DESCRIBED BY MIKE WEINBERG; SPLIT SPOON
SAMPLES DESCRIBED BY THOMAS SEAL; POROSITY VALUES
VISUALLY ESTIMATED; CONSULT PERMEMETER DATA SHEETS FOR
PERMEABILITY DATA;SAMPLES 10.5,20.5,30.5,36 DESCRIBED
BY MIKE WEINBERG; REMAINDER BY THOMAS SEAL

0. -	22.	090UDSC	UNDIFFERENTIATED SAND AND CLAY
22. -	30.5	122HTRN	HAWTHORN GROUP
30.5-	37.	124OCAL	OCALA GROUP

0 - 10.5 SAND; MODERATE BROWN TO MODERATE YELLOWISH BROWN; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-05%, CHERT-01%, PLANT REMAINS-03%, IRON STAIN-01%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

10.5- 12.5 SAND; DARK YELLOWISH BROWN; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): IRON CEMENT, CLAY MATRIX;
ACCESSORY MINERALS: CLAY-15%, IRON STAIN-01%, PLANT REMAINS-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

12.5- 20.5 CLAY; DARK YELLOWISH BROWN; 25% POROSITY, INTERGRANULAR; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-15%, CHERT-01%, PLANT REMAINS-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

20.5- 21 SAND; DARK YELLOWISH BROWN; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, IRON CEMENT;
ACCESSORY MINERALS: CLAY-15%, IRON STAIN-01%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

21 - 22.5 SAND; LIGHT OLIVE GRAY; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-25%, PLANT REMAINS-01%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

22.5- 30.5 CLAY; GRAYISH BROWN; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-40%, PLANT REMAINS-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

30.5- 32.5 SAND; LIGHT OLIVE GRAY; 15% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): PHOSPHATE CEMENT, CLAY MATRIX;
ACCESSORY MINERALS: CLAY-25%;
OTHER FEATURES: UNWASHED SAMPLE, DOLOMITIC;
FOSSILS: NO FOSSILS;
PHOSPHATIC CLAY CEMENT WITH MINOR DOLOSILT

32.5- 36 SAND; GRAYISH BROWN TO YELLOWISH GRAY; 05% POROSITY, LOW PERMEABILITY;
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-40%, LIMESTONE-02%, PLANT REMAINS-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

36 - 36.5 LIMESTONE; VERY LIGHT ORANGE; INTERGRANULAR, INTRAGRANULAR;
GRAIN TYPE: SKELETAL, CALCILUTITE; 45% ALLOCHEMICAL CONSTITUENTS;
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRANULE; POOR INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID;
FOSSILS INDICATIVE OF THE CRYSTAL RIVER FM

36.5 TOTAL DEPTH

LITHOLOGIC WELL LOG PRINTOUT SOURCE - FGS

WELL NUMBER: W- 16200
TOTAL DEPTH: 00090 FT.
19 SAMPLES FROM 11 TO 90 FT.

COUNTY - ALACHUA
LOCATION: T.07S R.18E S.27 A
LAT = N 29D 51M 01
LON = W 82D 30M 13

COMPLETION DATE - 11/12/88
OTHER TYPES OF LOGS AVAILABLE - NONE

ELEVATION - 160 FT

OWNER/DRILLER: FLORIDA GEOLOGICAL SURVEY - ALACHUA WELL # 3

WORKED BY: CUTTINGS DESCRIBED BY MIKE WEINBERG; SPLIT SPOON
SAMPLES DESCRIBED BY THOMAS SEAL; POROSITY VALUES
VISUALLY ESTIMATED; CONSULT PERMEAMETER DATA SHEETS
FOR PERMEABILITY VALUES
SAMPLES 10.5,14,20.5,30.5,40.5,43-50.5,53.5-90
DESCRIBED BY MIKE WEINBERG, REMAINDER BY THOMAS SEAL

0. -	22.	090UDSC	UNDIFFERENTIATED SAND AND CLAY
22. -	85.	122HTRN	HAWTHORN GROUP
85. -	90.	124OCAL	OCALA GROUP

0 - 10 SAND; PINKISH GRAY TO DARK YELLOWISH ORANGE; 20% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, IRON CEMENT;
ACCESSORY MINERALS: CLAY-20%, IRON STAIN-04%, PLANT REMAINS-03%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

10 - 12.5 SAND; VERY LIGHT ORANGE; 15% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-20%;
OTHER FEATURES: UNWASHED SAMPLE, DOLOMITIC;
FOSSILS: NO FOSSILS;

12.5- 14 SAND; YELLOWISH GRAY TO LIGHT YELLOWISH ORANGE; 20% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO VERY COARSE;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, IRON CEMENT;
ACCESSORY MINERALS: CLAY-20%, IRON STAIN-03%, PLANT REMAINS-05%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

14 - 20.5 SAND; YELLOWISH GRAY TO LIGHT YELLOWISH ORANGE; 15% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO VERY COARSE;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): IRON CEMENT, CLAY MATRIX, IRON CEMENT;
ACCESSORY MINERALS: IRON STAIN-10%, CLAY-15%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

20.5- 22.5 CLAY; LIGHT GREENISH YELLOW; INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: PHOSPHATIC SAND-05%, QUARTZ SAND-25%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

22.5- 30.5 SAND; GRAYISH BROWN TO YELLOWISH GRAY; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, IRON CEMENT;
ACCESSORY MINERALS: CLAY-10%, IRON STAIN-01%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

30.5- 32.5 SAND; VERY LIGHT ORANGE TO WHITE; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; MODERATE INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: PHOSPHATIC SAND-05%, CLAY-05%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

32.5- 40.5 SAND; GRAYISH BROWN TO YELLOWISH GRAY; 30% POROSITY, INTERGRANULAR, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; MODERATE INDURATION;
CEMENT TYPE(S): CLAY MATRIX, SILICIC CEMENT;
ACCESSORY MINERALS: CLAY-06%, QUARTZ-02%, IRON STAIN-01%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;
CLUMPS OF QTZ-GRAIN AGGREGATES CEMENTED BY SILICA

40.5- 42.5 SAND; VERY LIGHT ORANGE TO WHITE; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: PHOSPHATIC SAND-02%, CLAY-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

42.5- 43 SAND; GRAYISH BROWN TO DARK YELLOWISH ORANGE; 20% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; MODERATE INDURATION;
CEMENT TYPE(S): SILICIC CEMENT, CLAY MATRIX, IRON CEMENT;
ACCESSORY MINERALS: QUARTZ-04%, CLAY-05%, IRON STAIN-02%;
OTHER FEATURES: UNWASHED SAMPLE, DOLOMITIC;
FOSSILS: NO FOSSILS;
LOCALLY, MODERATELY INDURATED BY SILICA CEMENT

43 - 44 SANDSTONE; YELLOWISH GRAY TO LIGHT OLIVE; 15% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; MODERATE INDURATION;
CEMENT TYPE(S): SILICIC CEMENT, CLAY MATRIX, IRON CEMENT;
ACCESSORY MINERALS: QUARTZ-08%, CLAY-05%, PHOSPHATIC SAND-02%, LIMESTONE-10%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;
LIMESTONE OCCURS AS ROCK FRAGMENTS

44 - 50.5 SANDSTONE; YELLOWISH GRAY TO LIGHT OLIVE; 15% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; MODERATE INDURATION;
CEMENT TYPE(S): SILICIC CEMENT, CLAY MATRIX, IRON CEMENT;
ACCESSORY MINERALS: CLAY-35%, LIMESTONE-10%, QUARTZ-04%, PHOSPHATIC SAND-01%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;
CUTTINGS CONTAIN MIXED LITHOLOGIES: CLAY FRAGMENTS ARE WELL INDURATED, WAXY, & GREY TO GREEN IN COLOR

50.5- 52.5 SAND; VERY LIGHT ORANGE; 25% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-15%;
OTHER FEATURES: UNWASHED SAMPLE, CALCAREOUS;
FOSSILS: NO FOSSILS;

52.5- 53.5 CALCILUTITE; WHITE; POSSIBLY HIGH PERMEABILITY;
GRAIN TYPE: CALCILUTITE; 05% ALLOCHEMICAL CONSTITUENTS;
GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-05%, IRON STAIN-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

53.5- 54 CALCILUTITE; WHITE TO DARK YELLOWISH ORANGE; POSSIBLY HIGH PERMEABILITY;
GRAIN TYPE: CALCILUTITE; 20% ALLOCHEMICAL CONSTITUENTS;
GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX, IRON CEMENT;
ACCESSORY MINERALS: QUARTZ SAND-20%, IRON STAIN-05%, PHOSPHATIC SAND-01%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

54 - 58 SAND; YELLOWISH GRAY; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE;
ROUNDNESS: ANGULAR TO SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: CALCILUTITE-40%, IRON STAIN-01%, PHOSPHATIC SAND-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

58 - 60 CALCILUTITE; YELLOWISH GRAY; INTERGRANULAR, MOLDIC, POSSIBLY HIGH PERMEABILITY;
GRAIN TYPE: CALCILUTITE; 20% ALLOCHEMICAL CONSTITUENTS;
GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO GRANULE; POOR INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-20%, IRON STAIN-04%, PHOSPHATIC SAND-01%;
OTHER FEATURES: UNWASHED SAMPLE;

60 - 67 CALCILUTITE; YELLOWISH GRAY; POSSIBLY HIGH PERMEABILITY;
GRAIN TYPE: CALCILUTITE, CRYSTALS; 15% ALLOCHEMICAL CONSTITUENTS;
GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO GRANULE; POOR INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-15%, IRON STAIN-04%, PHOSPHATIC SAND-01%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

67 - 70 CALCILUTITE; YELLOWISH GRAY; POSSIBLY HIGH PERMEABILITY;
GRAIN TYPE: CALCILUTITE, CRYSTALS; 15% ALLOCHEMICAL CONSTITUENTS;
GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO COARSE; POOR INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-15%, CLAY-05%, PHOSPHATIC SAND-01%, IRON STAIN-03%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

70 - 80 SAND; YELLOWISH GRAY TO MODERATE YELLOWISH BROWN; POSSIBLY HIGH PERMEABILITY;
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: CALCILUTITE-35%, IRON STAIN-03%, PHOSPHATIC SAND-01%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

80 - 85 CALCILUTITE; YELLOWISH GRAY; POSSIBLY HIGH PERMEABILITY;
GRAIN TYPE: CALCILUTITE; 30% ALLOCHEMICAL CONSTITUENTS;
GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO MEDIUM; MODERATE INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-30%, PHOSPHATIC SAND-01%, IRON STAIN-01%,
PLANT REMAINS-01%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

85 - 90 CALCARENITE; YELLOWISH GRAY TO WHITE; POSSIBLY HIGH PERMEABILITY;
GRAIN TYPE: CALCILUTITE, CRYSTALS; 50% ALLOCHEMICAL CONSTITUENTS;
GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO VERY COARSE; MODERATE INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-35%, PHOSPHATIC SAND-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: BRYOZOA, BENTHIC FORAMINIFERA;
LEPIDOCYCLINA SP., NUMMULITES SPP.

90 TOTAL DEPTH

LITHOLOGIC WELL LOG PRINTOUT   SOURCE - FGS

WELL NUMBER: W- 16201   COUNTY - ALACHUA
TOTAL DEPTH: 00053 FT.   LOCATION: T.08S R.18E S.17 A
9 SAMPLES FROM 11 TO 53 FT.   LAT = N 29D 47M 52
LON = W 82D 31M 42
COMPLETION DATE - 16/12/87   ELEVATION - 115 FT
OTHER TYPES OF LOGS AVAILABLE - NONE

OWNER/DRILLER: FLORIDA GEOLOGICAL SURVEY - ALACHUA WELL #4

WORKED BY: CUTTINGS DESCRIBED BY MIKE WEINBERG; SPLIT SPOON SAMPLES DESCRIBED BY THOMAS SEAL; POROSITY VALUES VISUALLY ESTIMATED; CONSULT PERMEAMETER DATA SHEETS FOR PERMEABILITY VALUES; SAMPLES 19.5,40.5 WORKED BY BY MIKE WEINBERG; REMAINDER BY THOMAS SEAL

0. -	53.	090UDSC	UNDIFFERENTIATED SAND AND CLAY
53. -	.	124OCAL	OCALA GROUP

0 - 10.5 SAND; MODERATE YELLOWISH BROWN TO MODERATE BROWN; 20% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): IRON CEMENT, CLAY MATRIX;
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, CLAY-15%, PLANT REMAINS-10%;
OTHER FEATURES: DOLOMITIC, UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

10.5- 12.5 SAND; MODERATE YELLOWISH BROWN; 20% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): IRON CEMENT, CLAY MATRIX;
ACCESSORY MINERALS: PHOSPHATIC SAND-02%, CLAY-15%, PLANT REMAINS-10%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

12.5- 19.5 SAND; GRAYISH ORANGE TO YELLOWISH GRAY; 15% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-20%, PLANT REMAINS-10%, HEAVY MINERALS-01%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

19.5- 30.5 SAND; YELLOWISH GRAY; 20% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-15%, PLANT REMAINS-15%, HEAVY MINERALS-01%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

30.5- 32.5 AS ABOVE

32.5- 40.5 SAND; LIGHT RED TO LIGHT BROWN; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, IRON CEMENT;
ACCESSORY MINERALS: CLAY-04%, IRON STAIN-04%, PLANT REMAINS-02%;
OTHER FEATURES: UNWASHED SAMPLE, DOLOMITIC;
FOSSILS: NO FOSSILS;

40.5- 42.5 SAND; VERY LIGHT ORANGE; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; UNCONSOLIDATED;
ACCESSORY MINERALS: CLAY-05%, HEAVY MINERALS-01%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

42.5- 52.5 SAND; LIGHT BROWN; 15% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CALCILUTITE-10%, CLAY-25%;
OTHER FEATURES: UNWASHED SAMPLE, CALCAREOUS;
FOSSILS: NO FOSSILS;

52.5- 53 PACKSTONE; VERY LIGHT ORANGE TO WHITE; INTERGRANULAR, INTRAGRANULAR,
POSSIBLY HIGH PERMEABILITY;
GRAIN TYPE: SKELETAL, CALCILUTITE; 35% ALLOCHEMICAL CONSTITUENTS;
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO VERY COARSE; MODERATE INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: BENTHIC FORAMINIFERA, BRYOZOA, ECHINOID, MOLLUSKS;
INDEX FOSSILS INDICATIVE OF CRYSTAL RIVER FM.

53 TOTAL DEPTH

LITHOLOGIC WELL LOG PRINTOUT   SOURCE - FGS

WELL NUMBER: W- 16202   COUNTY - ALACHUA
TOTAL DEPTH: 00101 FT.   LOCATION: T.07S R.18E S.05 B
19 SAMPLES FROM 11 TO 101 FT.   LAT = N 29D 54M 30
LON = W 82D 31M 43
COMPLETION DATE - 15/01/88   ELEVATION - 140 FT
OTHER TYPES OF LOGS AVAILABLE - NONE

OWNER/DRILLER: FLORIDA GEOLOGICAL SURVEY - ALACHUA WELL # 5

WORKED BY: CUTTINGS DESCRIBED BY MIKE WEINBERG; SPLIT SPOON
SAMPLES DESCRIBED BY THOMAS SEAL; POROSITY VALUES
ESTIMATED VISUALLY; CONSULT PERMEAMETER DATA SHEETS
FOR PERMEABILITY VALUES
SAMPLES 20.5,30.5,40.5,50.5,60.5,70.5,71,80,85.5,88,
94 DESCRIBED BY MIKE WEINBERG; OTHERS BY THOMAS SEAL

0. -	20.	090UDSC	UNDIFFERENTIATED SAND AND CLAY
20. -	101.	122HTRN	HAWTHORN GROUP
101. -	.	124OCAL	OCALA GROUP

0 - 10.5 SAND; YELLOWISH GRAY TO MODERATE YELLOWISH BROWN; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): IRON CEMENT, CLAY MATRIX, PHOSPHATE CEMENT;
ACCESSORY MINERALS: IRON STAIN-05%, CLAY-15%, PLANT REMAINS-03%;
OTHER FEATURES: UNWASHED SAMPLE, DOLOMITIC;
FOSSILS: NO FOSSILS;

10.5- 20.5 CLAY; YELLOWISH GRAY TO DARK YELLOWISH ORANGE; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, PHOSPHATE CEMENT;
ACCESSORY MINERALS: QUARTZ SAND-35%, IRON STAIN-04%, PLANT REMAINS-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

20.5- 22.5 CLAY; DARK GRAYISH YELLOW; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-10%, PHOSPHATIC GRAVEL-02%, PHOSPHATIC SAND-02%;
OTHER FEATURES: UNWASHED SAMPLE, DOLOMITIC;
FOSSILS: NO FOSSILS;

22.5- 30.5 CLAY; YELLOWISH GRAY TO GRAYISH ORANGE; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-20%, IRON STAIN-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

30.5- 32.5 CLAY; WHITE TO DARK YELLOWISH ORANGE; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, PHOSPHATE CEMENT;
ACCESSORY MINERALS: IRON STAIN-01%, QUARTZ SAND-05%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

32.5- 40.5 SAND; GRAYISH BROWN; 25% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; MODERATE INDURATION;
CEMENT TYPE(S): CLAY MATRIX, IRON CEMENT, SILICIC CEMENT;
ACCESSORY MINERALS: CLAY-05%, IRON STAIN-02%, PHOSPHATIC SAND-01%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;
LOCALLY, SAND IS SILICA CEMENTED & INDURATED

40.5- 45.5 SAND; GRAYISH YELLOW; 25% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-05%, PHOSPHATIC SAND-03%;
OTHER FEATURES: UNWASHED SAMPLE, DOLOMITIC;
FOSSILS: NO FOSSILS;

45.5- 50.5 SAND; YELLOWISH GRAY TO MODERATE YELLOWISH BROWN; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO VERY COARSE;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, IRON CEMENT;
ACCESSORY MINERALS: CLAY-03%, IRON STAIN-02%, PHOSPHATIC SAND-01%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

50.5- 52.5 SAND; GRAYISH YELLOW; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED;
ACCESSORY MINERALS: CLAY-03%, HEAVY MINERALS-01%;
OTHER FEATURES: UNWASHED SAMPLE, DOLOMITIC;
FOSSILS: NO FOSSILS;

52.5- 60.5 SAND; GRAYISH BROWN; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, IRON CEMENT;
ACCESSORY MINERALS: CLAY-03%, IRON STAIN-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

60.5- 62.5 SAND; VERY LIGHT ORANGE; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; UNCONSOLIDATED;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-05%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;
THIN (10 CM) ZONE OF PHOSPHATIC CLAY

62.5- 70.5 SAND; GRAYISH BROWN TO WHITE; 25% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: CALCILUTITE-15%, PHOSPHATIC SAND-02%, IRON STAIN-04%;
OTHER FEATURES: UNWASHED SAMPLE, CALCAREOUS;
FOSSILS: NO FOSSILS;

70.5- 71 SAND; WHITE; 20% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; MODERATE INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: CALCILUTITE-25%, PHOSPHATIC SAND-03%;
OTHER FEATURES: UNWASHED SAMPLE, CALCAREOUS;
FOSSILS: NO FOSSILS;

71 - 80 SAND; GRAYISH ORANGE PINK TO DARK YELLOWISH ORANGE; 25% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO VERY COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: CALCILUTITE-35%, PHOSPHATIC SAND-03%, IRON STAIN-03%;
OTHER FEATURES: UNWASHED SAMPLE, CALCAREOUS;
FOSSILS: NO FOSSILS;

80 - 85.5 CLAY; LIGHT GREENISH YELLOW; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: IRON STAIN-03%, LIMESTONE-10%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;
TEXTURE OF CLAY RANGES FROM WAXY TO DULL; FRAGMENTS OF SAND IN A CALCAREOUS CLAY MATRIX

85.5- 87.5 SAND; VERY LIGHT ORANGE; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; UNCONSOLIDATED;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: HEAVY MINERALS-01%, PHOSPHATIC SAND-02%;
OTHER FEATURES: UNWASHED SAMPLE, DOLOMITIC;
FOSSILS: NO FOSSILS;

87.5- 88 SAND; YELLOWISH GRAY; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM;
ROUNDNESS:SUB-ANGULAR; HIGH SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, HEAVY MINERALS-01%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: BRYOZOA;

88 - 91 SAND; VERY LIGHT ORANGE; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, HEAVY MINERALS-01%;
OTHER FEATURES: UNWASHED SAMPLE, DOLOMITIC;
FOSSILS: NO FOSSILS;

91 - 94 SAND; PINKISH GRAY; 20% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; MODERATE INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: CALCILUTITE-40%, HEAVY MINERALS-02%, CHERT-01%;
OTHER FEATURES: UNWASHED SAMPLE, DOLOMITIC;
FOSSILS: NO FOSSILS;

94 - 101 CALCARENITE; VERY LIGHT ORANGE; INTERGRANULAR;
GRAIN TYPE: SKELETAL, CALCILUTITE; 70% ALLOCHEMICAL CONSTITUENTS;
GRAIN SIZE: FINE; RANGE; MICROCRYSTALLINE TO GRAVEL; MODERATE INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-05%;
OTHER FEATURES: COQUINA, UNWASHED SAMPLE;
FOSSILS: BRYOZOA, BENTHIC FORAMINIFERA;
LEPIDOCYCLINA PRESENT

101 TOTAL DEPTH

LITHOLOGIC WELL LOG PRINTOUT

SOURCE - FGS

WELL NUMBER: W- 16203
TOTAL DEPTH: 00030 FT.
6 SAMPLES FROM 10 TO 30 FT.

COUNTY - ALACHUA
LOCATION: T.10S R.20E S.21 B
LAT = N 29D 36M 22
LON = W 82D 18M 12

COMPLETION DATE - 06/01/88
OTHER TYPES OF LOGS AVAILABLE - NONE

ELEVATION - 060 FT

OWNER/DRILLER: FLORIDA GEOLOGICAL SURVEY - ALACHUA WELL # 6

WORKED BY: CUTTINGS DESCRIBED BY MIKE WEINBERG; SPLIT SPOON SAMPLES DESCRIBED BY THOMAS SEAL; POROSITY VALUES ESTIMATED VISUALLY; CONSULT PERMEAMETER DATA SHEETS FOR PERMEABILITY VALUES; SAMPLES 10,20,30 DESCRIBED BY MIKE WEINBERG; OTHERS BY THOMAS SEAL

0. -	20.	090UDSC	UNDIFFERENTIATED SAND AND CLAY
20. -	30.	122HTRN	HAWTHORN GROUP
30. -	.	124OCAL	OCALA GROUP

0 - 10 SAND; LIGHT BROWN; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; HIGH SPHERICITY; UNCONSOLIDATED;
ACCESSORY MINERALS: PLANT REMAINS-03%, HEAVY MINERALS-01%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

10 - 12 SAND; GRAYISH BROWN; 05% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX;
ACCESSORY MINERALS: CLAY-30%, HEAVY MINERALS-01%;
OTHER FEATURES: UNWASHED SAMPLE, DOLOMITIC;
FOSSILS: NO FOSSILS;

12 - 20 CLAY; GRAYISH ORANGE PINK; LOW PERMEABILITY; MODERATE INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-40%, IRON STAIN-01%, PLANT REMAINS-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

20 - 22 CLAY; LIGHT OLIVE TO LIGHT BROWN; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, PHOSPHATE CEMENT;
ACCESSORY MINERALS: QUARTZ SAND-10%, IRON STAIN-02%, PHOSPHATIC SAND-05%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

22 - 29 SAND; GRAYISH BROWN TO LIGHT BROWN; 20% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO VERY COARSE;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: LIMESTONE-05%, CLAY-25%, IRON STAIN-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

29 - 30 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY; INTERGRANULAR, INTRAGRANULAR,
POSSIBLY HIGH PERMEABILITY;
GRAIN TYPE: SKELETAL, CALCILUTITE; 35% ALLOCHEMICAL CONSTITUENTS;
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO GRANULE; POOR INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX, PHOSPHATE CEMENT;
ACCESSORY MINERALS: QUARTZ SAND-25%, CLAY-25%, PHOSPHATIC SAND-03%;
OTHER FEATURES: UNWASHED SAMPLE, CALCAREOUS;
FOSSILS: BENTHIC FORAMINIFERA, MOLLUSKS;
PROBABLE CONTACT OF HAWTHORN & CRYSTAL RIVER NUMEROUS LEPIDOCYCLINA AND LIMESTONE
FRAGMENTS MIXED WITH PHOSPHATIC SAND

30 TOTAL DEPTH

LITHOLOGIC WELL LOG PRINTOUT   SOURCE - FGS

WELL NUMBER: W- 16204   COUNTY - ALACHUA
TOTAL DEPTH: 00042 FT.   LOCATION: T.10S R.20E S.28
8 SAMPLES FROM 10 TO 42 FT.   LAT = N 29D 35M 19
LON = W 82D 18M 52

COMPLETION DATE - 08/01/88   ELEVATION - 060 FT
OTHER TYPES OF LOGS AVAILABLE - NONE

OWNER/DRILLER: FLORIDA GEOLOGICAL SURVEY FOR ALACHUA COUNTY

WORKED BY: CUTTINGS DESCRIBED BY MIKE WEINBERG; SPLIT SPOON SAMPLES DESCRIBED BY THOMAS SEAL; CONSULT PERMEAMETER DATA SHEETS FOR PERMEABILITY VALUES; POROSITY VALUES ESTIMATED VISUALLY; SAMPLES 10,40 DESCRIBED BY MIKE WEINBERG; OTHER SAMPLES DESCRIBED BY THOMAS SEAL

0. - 32. 090UDSC UNDIFFERENTIATED SAND AND CLAY
32. - . 124OCAL OCALA GROUP

0 - 10 PEAT; DARK GRAY TO YELLOWISH GRAY; POSSIBLY HIGH PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): ORGANIC MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-20%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

10 - 11.5 CLAY; YELLOWISH GRAY; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, DOLOMITE CEMENT, CALCILUTITE MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-15%, PHOSPHATIC SAND-02%, CALCILUTITE-20%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

11.5- 12 CLAY; DARK BROWN; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-15%, PHOSPHATIC SAND-07%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;
CARBONATE-RICH CLAY ZONE

12 - 20 CLAY; DARK YELLOWISH BROWN TO DARK BROWN; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, ORGANIC MATRIX, CALCILUTITE MATRIX;
ACCESSORY MINERALS: PLANT REMAINS-15%, QUARTZ SAND-15%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: MOLLUSKS;
FRESHWATER SNAIL FOSSILS IN ORGANIC RICH CLAY THESE GASTROPODS ARE PROBABLY IN PLACE, BUT MAY BE DUE TO UPHOLE CONTAMINATION

20 - 22 CLAY; DARK YELLOWISH BROWN; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX;
ACCESSORY MINERALS: CALCILUTITE-20%, QUARTZ SAND-08%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: MOLLUSKS, FOSSIL FRAGMENTS;

22 - 30 CLAY; MODERATE GRAY TO BLACK; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): ORGANIC MATRIX, CLAY MATRIX;
ACCESSORY MINERALS: PLANT REMAINS-30%, QUARTZ SAND-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: MOLLUSKS, FOSSIL FRAGMENTS;
ABUNDANT, WELL PRESERVED TERRESTRIAL SNAILS ORGANIC MATTER IS GENERALLY NON-FIBROUS

30 - 32 LIMESTONE; DARK YELLOWISH BROWN TO BLACK; LOW PERMEABILITY, POSSIBLY HIGH PERMEABILITY;
GRAIN TYPE: CALCILUTITE; 10% ALLOCHEMICAL CONSTITUENTS;
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, ORGANIC MATRIX, CALCILUTITE MATRIX;
ACCESSORY MINERALS: PLANT REMAINS-20%, CLAY-20%, QUARTZ SAND-10%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: MOLLUSKS;
POSSIBLE SINKHOLE FILL; CLAY RICH ZONES, WITH CLAY APPROACHING 20-40%, CALCILUTITE VARIABLE AS WELL AS SAND

32 - 40 SAND; BLACK TO MODERATE GRAY; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE;
ROUNDNESS:SUB-ANGULAR; HIGH SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): ORGANIC MATRIX;
ACCESSORY MINERALS: PLANT REMAINS-40%, LIMESTONE-03%, CLAY-05%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: MOLLUSKS, ECHINOID, BENTHIC FORAMINIFERA;
LEPIDOCYCLINA SP. PRESENT

40 - 42 PACKSTONE; LIGHT GRAY; 25% POROSITY, INTERGRANULAR;
GRAIN TYPE: CALCILUTITE, SKELETAL; 50% ALLOCHEMICAL CONSTITUENTS;
GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO GRAVEL; MODERATE INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
OTHER FEATURES: UNWASHED SAMPLE, COQUINA;
FOSSILS: BRYOZOA, BENTHIC FORAMINIFERA;
FORAM COQUINA WITH MICRITIC MATRIX LEPIDOCYCLINA PRESENT

42 TOTAL DEPTH

LITHOLOGIC WELL LOG PRINTOUT

SOURCE - FGS

WELL NUMBER: W- 16205
TOTAL DEPTH: 00065 FT.
SAMPLES - NONE

COUNTY - ALACHUA
LOCATION: T.11S R.20E S.03
LAT = N 29D 32M 42
LON = W 82D 17M 54

COMPLETION DATE - 14/01/88
OTHER TYPES OF LOGS AVAILABLE - NONE

ELEVATION - 085 FT

OWNER/DRILLER: ALACHUA WELL #8 /(FGS) JOHN MORRILL

WORKED BY: WELL CUTTINGS WORKED BY JOEL DUNCAN & MIKE WEINBERG
WELL ENDS IN THE HAWTHORNE FORMATION
THIS WELL IS EQUIVALENT TO ALACHUA AMBIENT #8

0. - 26. 090UDSC UNDIFFERENTIATED SAND AND CLAY
26. - . 122HTRN HAWTHORN GROUP

0. - 10 SAND; MODERATE YELLOWISH BROWN; 20% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO VERY COARSE;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-20%, HEAVY MINERALS-01%, PLANT REMAINS-03%;
FOSSILS: NO FOSSILS;

10 - 12 SAND; YELLOWISH GRAY TO GRAYISH BROWN; INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-15%;
FOSSILS: NO FOSSILS;

12 - 20 SAND; GRAYISH BROWN; 15% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; MODERATE INDURATION;
CEMENT TYPE(S): SILICIC CEMENT, CLAY MATRIX;
ACCESSORY MINERALS: CLAY-15%, HEAVY MINERALS-01%, PLANT REMAINS-05%, IRON STAIN-01%;
FOSSILS: NO FOSSILS;

20 - 22 SAND; VERY LIGHT GRAY TO YELLOWISH GRAY; INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-15%, HEAVY MINERALS-01%;
FOSSILS: NO FOSSILS;

22 - 26 SAND; GRAYISH BROWN; 15% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; MODERATE INDURATION;
CEMENT TYPE(S): SILICIC CEMENT, CLAY MATRIX;
ACCESSORY MINERALS: CLAY-15%, HEAVY MINERALS-01%, PLANT REMAINS-05%, IRON STAIN-01%;

26 - 30 CLAY; DARK YELLOWISH ORANGE TO GRAYISH BROWN; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: IRON STAIN-07%, QUARTZ-03%, PLANT REMAINS-03%;
OTHER FEATURES: PLASTIC;
FOSSILS: NO FOSSILS;

30 - 32 CLAY; LIGHT BLUE GREEN; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
SEDIMENTARY STRUCTURES: MOTTLED,
ACCESSORY MINERALS: QUARTZ SAND-15%, SILT-20%, SHALE-01%;
FOSSILS: ORGANICS;
SAND IS VERY FINE-GRAINED; SUBANGULAR TO ANGULAR; LIGHT GRAY IN COLOR TWO CLAY TYPES: DARK
YELLOW & GREENISH-GRAY MOTTLED TEXTURE IS QUESTIONABLE IN ORIGIN

32 - 40 CLAY; GRAYISH BROWN TO DARK YELLOWISH ORANGE; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-15%, IRON STAIN-05%;
FOSSILS: NO FOSSILS;

40 - 40.5 CLAY; LIGHT OLIVE TO GRAYISH OLIVE; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-40%, PHOSPHATIC SAND-01%;
OTHER FEATURES: PLASTIC;
FOSSILS: NO FOSSILS;

40.5- 42 DOLO-SILT; YELLOWISH GRAY; INTERGRANULAR; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, DOLOMITE CEMENT;
ACCESSORY MINERALS: CLAY-07%, QUARTZ SAND-20%, PHOSPHATIC SAND-05%;
FOSSILS: NO FOSSILS;
NUMEROUS ROUNDED PHOSPHATIC UNLITHIFIED CLAY CLASTS NOTED SILT-SIZED DOLOMITE RHOMBS
COMMON

42 - 50 CLAY; GRAYISH BROWN; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: IRON STAIN-02%, QUARTZ SAND-15%;
FOSSILS: NO FOSSILS;

50 - 50.5 CLAY; LIGHT OLIVE; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, DOLOMITE CEMENT;
ACCESSORY MINERALS: DOLOMITE-35%, PHOSPHATIC SAND-05%, CALCITE-02%;
FOSSILS: NO FOSSILS;
CLAY AND DOLOSILT; ROUNDED PHOSPHATIC CLAY CLASTS

50.5- 52 CLAY; LIGHT OLIVE; LOW PERMEABILITY; MODERATE INDURATION;
CEMENT TYPE(S): CLAY MATRIX, DOLOMITE CEMENT;
ACCESSORY MINERALS: PHOSPHATIC SAND-01%;
FOSSILS: NO FOSSILS;
SEVERAL CENTIMETER THICK DOLOSILT STRINGERS THROUGHOUT INTERVAL

52 - 55 CLAY; GRAYISH BROWN; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: IRON STAIN-03%, QUARTZ SAND-15%, LIMESTONE-01%;
FOSSILS: NO FOSSILS;

55 - 60 CALCILUTITE; ; 15% POROSITY, INTERGRANULAR;
GRAIN TYPE: CALCILUTITE; 22% ALLOCHEMICAL CONSTITUENTS;
POOR INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-20%, PHOSPHATIC SAND-02%;
FOSSILS: NO FOSSILS;
QTZ CONTENT OF CUTTINGS HIGHLY VARIABLE, RANGING FROM 0-50% WITH 20% THE AVERAGE

60 - 61 SAND; YELLOWISH GRAY TO MODERATE YELLOWISH BROWN; INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; LOW SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
SEDIMENTARY STRUCTURES: MOTTLED,
ACCESSORY MINERALS: PHOSPHATIC SAND-10%, CLAY-30%, SILT-10%;
OTHER FEATURES: PLASTIC;
FOSSILS: NO FOSSILS;
SILT CONTENT ACTUALLY DOLOSILT; INTERVAL CONTAINS UP TO GRAVEL-SIZED PHOSPHATE GRAINS

61 - 62 DOLOMITE; WHITE TO VERY LIGHT GRAY; 05% POROSITY, INTERGRANULAR;
50-90% ALTERED;
GRAIN SIZE: CRYPTOCRYSTALLINE; RANGE: CRYPTOCRYSTALLINE TO MEDIUM; GOOD INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT;
ACCESSORY MINERALS: PHOSPHATIC SAND-05%, QUARTZ SAND-05%, CLAY-10%;
FOSSILS: NO FOSSILS;
INDURATION IS VARIABLE, RANGING FROM POOR TO WELL INDURATED, WITH WELL INDURATED BEING THE MOST REPRESENTATIVE OF THE SAMPLE

62 - 64 NO SAMPLES

64 - 65 SANDSTONE; MODERATE ORANGE PINK; INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; MODERATE INDURATION;
CEMENT TYPE(S): CLAY MATRIX, IRON CEMENT;
ACCESSORY MINERALS: IRON STAIN-05%, CLAY-30%;
FOSSILS: NO FOSSILS;

65 TOTAL DEPTH

LITHOLOGIC WELL LOG PRINTOUT SOURCE - FGS

WELL NUMBER: W- 16206
TOTAL DEPTH: 00125 FT.
22 SAMPLES FROM 10 TO 125 FT.

COUNTY - ALACHUA
LOCATION: T.09S R.20E S.06
LAT = N 29D 44M 54
LON = W 82D 20M 44

COMPLETION DATE - 26/01/88
ELEVATION - 175 FT
OTHER TYPES OF LOGS AVAILABLE - NONE

OWNER/DRILLER: FLORIDA GEOLOGICAL SURVEY - ALACHUA WELL #9

WORKED BY: CUTTINGS DESCRIBED BY MIKE WEINBERG; SPLIT SPOON SAMPLES DESCRIBED BY THOMAS SEAL; POROSITY VALUES ESTIMATED VISUALLY; CONSULT PERMEAMETER DATA SHEETS FOR PERMEABILITY VALUES; SAMPLES 10,20,27,35,43,50,60, 70,80,90,100,115-125 DESCRIBED BY MIKE WEINBERG; REMAINING SAMPLES DESCRIBED BY THOMAS SEAL

0. -	27.	090UDSC	UNDIFFERENTIATED SAND AND CLAY
27. -	120.	122HTRN	HAWTHORN GROUP
120. -	.	124OCAL	OCALA GROUP

0 - 10 SAND; GRAYISH BROWN TO MODERATE REDDISH ORANGE; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO VERY COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, IRON CEMENT;
ACCESSORY MINERALS: CLAY-04%, IRON STAIN-03%, HEAVY MINERALS-02%, PLANT REMAINS-04%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

10 - 11 SAND; LIGHT OLIVE GRAY; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, IRON CEMENT;
ACCESSORY MINERALS: CLAY-05%, IRON STAIN-02%, HEAVY MINERALS-01%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

11 - 20 SAND; GRAYISH BROWN; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO VERY COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-07%, HEAVY MINERALS-02%, IRON STAIN-01%, PLANT REMAINS-03%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

20 - 22 SAND; LIGHT OLIVE GRAY; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-02%, HEAVY MINERALS-01%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

22 - 27 SAND; GRAYISH BROWN TO MODERATE YELLOWISH BROWN; 12% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO VERY COARSE;
ROUNDNESS:SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-35%, PHOSPHATIC SAND-04%, IRON STAIN-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

27 - 30 DOLO-SILT; GRAYISH BROWN; 20% POROSITY, INTERGRANULAR; POOR INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT, CLAY MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-15%, CLAY-12%, PHOSPHATIC SAND-02%, IRON STAIN-01%;
OTHER FEATURES: SUCROSIC, UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

30 - 31 DOLO-SILT; GRAYISH ORANGE; 25% POROSITY, INTERGRANULAR; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, PHOSPHATE CEMENT;
ACCESSORY MINERALS: QUARTZ SAND-10%, PHOSPHATIC SAND-05%, CLAY-10%;
OTHER FEATURES: UNWASHED SAMPLE, SUCROSIC;
FOSSILS: NO FOSSILS;
DOLOSILT LITHOLOGY, WITH ABUNDANT ACCESSORY MINERALS, IS PRESENT BETWEEN 30 & 44 FEET

31 - 35 DOLO-SILT; VERY LIGHT ORANGE TO GRAYISH BROWN; 15% POROSITY, INTERGRANULAR;
MODERATE INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT, CLAY MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-20%, CLAY-15%, PHOSPHATIC SAND-01%;
OTHER FEATURES: SUCROSIC, UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

35 - 43 DOLO-SILT; YELLOWISH GRAY; 15% POROSITY, INTERGRANULAR; MODERATE INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT;
ACCESSORY MINERALS: QUARTZ SAND-25%, CLAY-15%, PHOSPHATIC SAND-01%;
OTHER FEATURES: SUCROSIC, UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

43 - 44 DOLO-SILT; YELLOWISH GRAY; 20% POROSITY, INTERGRANULAR; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, PHOSPHATE CEMENT, DOLOMITE CEMENT;
ACCESSORY MINERALS: QUARTZ SAND-05%, CLAY-05%;
OTHER FEATURES: UNWASHED SAMPLE, SUCROSIC, DOLOMITIC;
FOSSILS: NO FOSSILS;

44 - 45 CLAY; LIGHT OLIVE GRAY TO YELLOWISH GRAY; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): PHOSPHATE CEMENT, CLAY MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-01%;
OTHER FEATURES: DOLOMITIC, UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

45 - 50 CALCILUTITE; LIGHT OLIVE GRAY; INTERGRANULAR;
GRAIN TYPE: CALCILUTITE; 40% ALLOCHEMICAL CONSTITUENTS;
GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO VERY COARSE; POOR INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-35%, CLAY-15%, PHOSPHATIC SAND-04%, DOLOMITE-15%;
OTHER FEATURES: UNWASHED SAMPLE, DOLOMITIC;
FOSSILS: NO FOSSILS;

50 - 52 SAND; YELLOWISH GRAY; 05% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX;
ACCESSORY MINERALS: CLAY-40%, PHOSPHATIC SAND-05%, HEAVY MINERALS-02%, DOLOMITE-03%;
OTHER FEATURES: DOLOMITIC, UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

52 - 60 SAND; OLIVE GRAY; 12% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRANULE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX;
ACCESSORY MINERALS: CLAY-12%, PHOSPHATIC SAND-07%, CHERT-03%, CALCILUTITE-03%;
OTHER FEATURES: UNWASHED SAMPLE, CALCAREOUS;
FOSSILS: NO FOSSILS;

60 - 62 SAND; LIGHT OLIVE GRAY; 10% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; UNCONSOLIDATED;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: PHOSPHATIC SAND-15%, CLAY-20%, HEAVY MINERALS-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

62 - 70 SAND; OLIVE GRAY TO LIGHT OLIVE GRAY; 10% POROSITY, INTERGRANULAR;
GRAIN SIZE: COARSE; RANGE: FINE TO GRANULE;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-40%, PHOSPHATIC SAND-07%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

70 - 71 CLAY; GRAYISH ORANGE TO MODERATE YELLOWISH BROWN; INTERGRANULAR, LOW PERMEABILITY;
POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, PHOSPHATE CEMENT;
ACCESSORY MINERALS: QUARTZ SAND-10%, PHOSPHATIC SAND-01%;
OTHER FEATURES: UNWASHED SAMPLE, DOLOMITIC;
FOSSILS: NO FOSSILS;

71 - 80 SAND; OLIVE GRAY; INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, PHOSPHATE CEMENT;
ACCESSORY MINERALS: PHOSPHATIC SAND-05%, CALCILUTITE-15%, CLAY-25%;
OTHER FEATURES: UNWASHED SAMPLE, COQUINA;
FOSSILS: NO FOSSILS;

80 - 81 CLAY; OLIVE GRAY; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, PHOSPHATE CEMENT;
ACCESSORY MINERALS: QUARTZ SAND-05%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

81 - 90 SAND; GRAYISH BROWN; 25% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM;
ROUNDNESS: ANGULAR TO SUB-ANGULAR; LOW SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: CALCILUTITE-35%, PHOSPHATIC SAND-02%, IRON STAIN-02%, CLAY-05%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

90 - 100 SAND; YELLOWISH GRAY; 20% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRAVEL;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: CALCILUTITE-35%, PHOSPHATIC GRAVEL-03%, PHOSPHATIC SAND-04%,
LIMESTONE-05%;
OTHER FEATURES: UNWASHED SAMPLE, CALCAREOUS;
FOSSILS: NO FOSSILS;
CUTTINGS CONTAIN FRAGMENTS OF WHITE, PHOSPHATIC LIMESTONE

100 - 101 CLAY; DARK GREENISH GRAY; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX;
ACCESSORY MINERALS: CALCILUTITE-20%, QUARTZ SAND-05%;
OTHER FEATURES: UNWASHED SAMPLE, CALCAREOUS;
FOSSILS: NO FOSSILS;

101 - 110 SAND; DARK YELLOWISH BROWN; 10% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO VERY COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX, PHOSPHATE CEMENT;
ACCESSORY MINERALS: CLAY-20%, LIMESTONE-10%, PHOSPHATIC SAND-05%, PHOSPHATIC GRAVEL-01%;
OTHER FEATURES: UNWASHED SAMPLE, DOLOMITIC;
FOSSILS: NO FOSSILS;

110 - 111 CLAY; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY; LOW PERMEABILITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX;
ACCESSORY MINERALS: CALCILUTITE-10%, QUARTZ SAND-20%, PHOSPHATIC SAND-05%;
OTHER FEATURES: UNWASHED SAMPLE, DOLOMITIC;
FOSSILS: NO FOSSILS;

111 - 115 DOLOMITE; GRAYISH BROWN; LOW PERMEABILITY; 50-90% ALTERED; SUBHEDRAL;
GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO VERY COARSE; MODERATE INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT;
ACCESSORY MINERALS: QUARTZ SAND-05%, PHOSPHATIC SAND-02%, LIMESTONE-05%, IRON-STAIN-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: NO FOSSILS;

115 - 120 CALCILUTITE; VERY LIGHT ORANGE; 20% POROSITY, INTERGRANULAR, PIN POINT VUGS;
GRAIN TYPE: SKELETAL, CRYSTALS, CALCILUTITE; 40% ALLOCHEMICAL CONSTITUENTS;
GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO GRAVEL; MODERATE INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: IRON STAIN-01%, PYRITE-01%, QUARTZ SAND-02%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: BRYOZOA, BENTHIC FORAMINIFERA;
CRYSTAL RIVER FM., LEPIDOCYCLINA OCALANA

120 - 125 CALCILUTITE; VERY LIGHT ORANGE; 20% POROSITY, INTERGRANULAR, PIN POINT VUGS;
GRAIN TYPE: SKELETAL, CRYSTALS, CALCILUTITE; 40% ALLOCHEMICAL CONSTITUENTS;
GRAIN SIZE: MICROCRYSTALLINE; RANGE: MICROCRYSTALLINE TO GRAVEL; MODERATE INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-03%;
OTHER FEATURES: UNWASHED SAMPLE;
FOSSILS: BENTHIC FORAMINIFERA, BRYOZOA;

125 TOTAL DEPTH

LITHOLOGIC WELL LOG PRINTOUT SOURCE - FGS

WELL NUMBER: W- 16207
TOTAL DEPTH: 191 FT.
SAMPLES - NONE

COUNTY - ALACHUA
LOCATION: T.09S R.21E S.04
LAT = N 29D 44M 01
LON = W 82D 13M 19

COMPLETION DATE - 14/02/88
ELEVATION - 150 FT
OTHER TYPES OF LOGS AVAILABLE - NONE

OWNER/DRILLER: FGS FOR ALACHUA COUNTY - AMBIENT STUDY CORE # 10

WORKED BY: DESCRIBED BY J.DUNCAN 8/88
SAMPLE LOSS : 1 FT AT 98-99 FT; 2 FT 105-108 FT; 29 FT AT 130-159 FT;1 FT AT 167-172 FT; 4 FT AT 174-178 FT; 3 FT AT 182-191 FT;

0.0-	16.5	090UDSC	UNDIFFERENTIATED SAND AND CLAY
16.5-	24.2	122CHAR	CHARLTON MEMBER OF COOSAWHATCHIE FM.
24.2-	69.0	122COOS	COOSAWHATCHIE FM.
69.0-	94.0	122MKHD	MARKSHEAD FM.
94.0-	173.7	122PNFM	PENNEY FARMS FM.
173.7-	191.0	124OCAL	OCALA GROUP

0 - 2.5 SAND; YELLOWISH GRAY TO GRAYISH BROWN; 53% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; UNCONSOLIDATED;
ACCESSORY MINERALS: HEAVY MINERALS-01%, SHALE-03%, PLANT REMAINS-01%;

2.5- 3.5 SAND; BROWNISH GRAY TO DARK YELLOWISH BROWN; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: ROUNDED TO SUB-ANGULAR; LOW SPHERICITY; UNCONSOLIDATED;
ACCESSORY MINERALS: SHALE-04%, PLANT REMAINS-01%;

3.5- 4.5 SAND; MODERATE DARK GRAY TO LIGHT GRAY; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; LOW SPHERICITY; UNCONSOLIDATED;
ACCESSORY MINERALS: SHALE-05%, PLANT REMAINS-02%;
FINER GRAINS ARE MORE ANGULAR THAN COARSER GRAINS; ORGANIC CONTENT DECREASES WITH DEPTH;

4.5- 5.5 SAND; DARK BROWN TO DARK YELLOWISH BROWN; 25% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE;
ROUNDNESS: ROUNDED TO SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): ORGANIC MATRIX, CLAY MATRIX;
ACCESSORY MINERALS: SHALE-07%, PLANT REMAINS-02%, CLAY-02%;

5.5- 5.9 SAND; DARK YELLOWISH BROWN; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; LOW SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX, ORGANIC MATRIX;
ACCESSORY MINERALS: SHALE-02%, PLANT REMAINS-02%, CLAY-02%, SILT-01%;

5.9- 7 SAND; VERY LIGHT ORANGE TO GRAYISH BROWN; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE;
ROUNDNESS: ROUNDED TO SUB-ANGULAR; LOW SPHERICITY; UNCONSOLIDATED;
ACCESSORY MINERALS: PLANT REMAINS-01%, SILT-01%;

7 - 8 SAND; GRAYISH BROWN; NF% POROSITY, , , ;
GRAIN SIZE: MEDIUM; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-03%, SILT-05%, PLANT REMAINS-01%;

8 - 12 SAND; GRAYISH ORANGE TO MODERATE ORANGE PINK; 25% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRAVEL;
ROUNDNESS: ROUNDED TO SUB-ANGULAR; LOW SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-15%;
GRAIN SIZE DECREASES DOWNWARD IN SECTION

12 - 14.2 SAND; PINKISH GRAY TO YELLOWISH GRAY; 25% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE;
ROUNDNESS: ROUNDED TO SUB-ANGULAR; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-10%, SILT-01%;

14.2- 14.7 SAND; VERY LIGHT GRAY TO PINKISH GRAY; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: COARSE; RANGE: FINE TO GRAVEL;
ROUNDNESS: ROUNDED TO SUB-ANGULAR; LOW SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-02%;

14.7- 16.5 SAND; YELLOWISH GRAY TO PINKISH GRAY; 25% POROSITY, INTERGRANULAR;
GRAIN SIZE: COARSE; RANGE: FINE TO GRAVEL;
ROUNDNESS: ROUNDED TO SUB-ANGULAR; LOW SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
SEDIMENTARY STRUCTURES: BIOTURBATED,
ACCESSORY MINERALS: CLAY-10%, HEAVY MINERALS-01%, SHALE-01%;
GRAVEL SIZE GRAINS COMMON. TOP OF HAWTHORNE GROUP @ 16.5 FT.

16.5- 24.2 CLAY; GRAYISH GREEN TO LIGHT GRAYISH GREEN; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
SEDIMENTARY STRUCTURES: BIOTURBATED,
CHARLTON MBR. OF THE COOSAHACTHEE FM. 16.5 - 24.2 FT. BIOTURBATION EVIDENT ALONG CONTACT ZONE WITH OVERLYING SAND.

24.2- 25.8 SAND; WHITE TO VERY LIGHT GRAY; 25% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: CLAY-05%, HEAVY MINERALS-01%;

25.8- 27 CLAY; GRAYISH GREEN TO LIGHT GRAYISH GREEN; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
FINE GRAIN SAND INTERBEDDED WITH CLAY NEAR BASE OF INTERVAL.

27 - 27.5 CLAY; GRAYISH GREEN TO LIGHT GRAYISH GREEN; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
SEDIMENTARY STRUCTURES: BIOTURBATED,
ACCESSORY MINERALS: PHOSPHATIC GRAVEL-10%, QUARTZ SAND-05%, HEAVY MINERALS-01%;
SAND CONTENT INCREASES TOWARD BASE OF INTERVAL.

27.5- 31.4 DOLO-SILT; YELLOWISH GRAY TO LIGHT GREENISH GRAY; 25% POROSITY, INTERGRANULAR;
POOR INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT;
ACCESSORY MINERALS: PHOSPHATIC SAND-05%, HEAVY MINERALS-01%, QUARTZ SAND-05%;
PHOSPHATE CONTENT INCREASES WITH DEPTH.

31.4- 31.7 CLAY; GRAYISH GREEN TO LIGHT GRAYISH GREEN; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
SEDIMENTARY STRUCTURES: BIOTURBATED,
ACCESSORY MINERALS: PHOSPHATIC GRAVEL-25%, DOLOMITE-15%, QUARTZ SAND-02%;
DOLOMITE IS ACTUALLY A DOLOSILT PHOSPHATIC GRAVEL UP TO SEVERAL CM IN DIAMETER COMMON.

31.7- 33 DOLO-SILT; YELLOWISH GRAY TO LIGHT GREENISH GRAY; 25% POROSITY, INTERGRANULAR;
POOR INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT;
ACCESSORY MINERALS: PHOSPHATIC SAND-05%, QUARTZ SAND-07%, CLAY-05%;
FOSSILS: SHARKS TEETH;

33 - 33.5 DOLO-SILT; YELLOWISH GRAY TO VERY LIGHT ORANGE; 25% POROSITY, INTERGRANULAR;
MODERATE INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT, CLAY MATRIX;
ACCESSORY MINERALS: PHOSPHATIC SAND-04%, QUARTZ SAND-04%, CLAY-02%;
FOSSILS: MOLLUSKS;
MORE INDURATED THAN SEDIMENT ABOVE AND BELOW. 3CM DIAMETER PELECYPOD MOLD.

33.5- 34.3 DOLO-SILT; YELLOWISH GRAY TO VERY LIGHT ORANGE; 25% POROSITY, INTERGRANULAR;
POOR INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT;
ACCESSORY MINERALS: PHOSPHATIC SAND-07%, QUARTZ SAND-04%, CLAY-03%, PHOSPHATIC GRAVEL-02%;
QUARTZ CONTENT INCREASES FROM 1% AT THE TOP TO 4% AT THE BASE OF THE INTERVAL.

34.3- 34.7 DOLO-SILT; MODERATE REDDISH ORANGE TO LIGHT BROWN; 25% POROSITY, INTERGRANULAR;
POOR INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT;
ACCESSORY MINERALS: QUARTZ SAND-20%, PHOSPHATIC SAND-03%, IRON STAIN-01%,
PHOSPHATIC GRAVEL-01%;

34.7- 35.9 SAND; YELLOWISH GRAY TO GRAYISH YELLOW; 35% POROSITY, INTERGRANULAR;
UNCONSOLIDATED;
ACCESSORY MINERALS: DOLOMITE-10%, PHOSPHATIC SAND-08%, PHOSPHATIC GRAVEL-02%, CLAY-02%;
DOLOMITE IS DOLOSILT.

35.9- 37 DOLO-SILT; YELLOWISH GRAY; 20% POROSITY, INTERGRANULAR; POOR INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT;
ACCESSORY MINERALS: QUARTZ SAND-02%, PHOSPHATIC SAND-02%, PHOSPHATIC GRAVEL-01%;
OTHER FEATURES: SUCROSIC;
PHOSPHATIC GRAVEL AT TOP OF INTERVAL

37 - 38.5 DOLO-SILT; VERY LIGHT ORANGE TO YELLOWISH GRAY; 25% POROSITY, INTERGRANULAR;
POOR INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT, CLAY MATRIX;
ACCESSORY MINERALS: CLAY-07%, QUARTZ SAND-25%, PHOSPHATIC SAND-03%;
OTHER FEATURES: SPLINTERY;
FOSSILS: FOSSIL MOLDS, MOLLUSKS;

38.5- 39 CLAY; LIGHT GRAYISH GREEN TO GRAYISH GREEN; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: PHOSPHATIC GRAVEL-07%, DOLOMITE-20%;
FOSSILS: FOSSIL MOLDS;
3CM THICK DOLOMITE ZONE WITH GOOD INDURATION IN MIDDLE OF INTERVAL.

39 - 42 DOLO-SILT; YELLOWISH GRAY TO YELLOWISH GRAY; 25% POROSITY, INTERGRANULAR; POOR INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-40%, PHOSPHATIC SAND-04%;

42 - 42.7 GRAVEL; DARK BROWN TO VERY LIGHT ORANGE; INTERGRANULAR; UNCONSOLIDATED;
ACCESSORY MINERALS: DOLOMITE-45%, PHOSPHATIC GRAVEL-50%, QUARTZ SAND-01%, CLAY-02%;
FOSSILS: SHARKS TEETH, MOLLUSKS, FOSSIL MOLDS;
FRAGMENTS OF WELL INDURATED DOLOMITE THROUGH OUT INTERVAL.

42.7- 45.1 SAND; MODERATE YELLOWISH BROWN TO LIGHT BROWN; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; LOW SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: DOLOMITE-07%, CLAY-03%, PHOSPHATIC SAND-03%;

45.1- 49 SAND; YELLOWISH GRAY TO LIGHT GREENISH GRAY; 30% POROSITY, INTERGRANULAR;
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; LOW SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: DOLOMITE-10%, PHOSPHATIC SAND-04%, CLAY-02%;
PHOSPHATE DECREASES TO TRACE LEVELS AT INTERVAL BASE.

49 - 51.2 SAND; VERY LIGHT ORANGE TO YELLOWISH GRAY; 25% POROSITY, INTERGRANULAR;
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRAVEL;
ROUNDNESS: SUB-ANGULAR TO ANGULAR; LOW SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: DOLOMITE-39%, PHOSPHATIC SAND-05%, PHOSPHATIC GRAVEL-04%, CLAY-02%;
FOSSILS: SHARKS TEETH;
NUMEROUS STINGRAY TEETH AT BASE OF INTERVAL ALONG WITH SHARKS TEETH. DOLOMITE IS DOLOSILT

51.2- 54.8 CLAY; LIGHT OLIVE BROWN TO DARK GRAYISH YELLOW; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: IRON STAIN-07%, QUARTZ SAND-01%, SILT-01%, PHOSPHATIC SAND-01%;
FOSSILS: SHARKS TEETH;

54.8- 58 CLAY; OLIVE GRAY TO GREENISH GRAY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-03%, IRON STAIN-04%, PHOSPHATIC SAND-01%, SILT-02%;
OTHER FEATURES: PARTINGS;
FOSSILS: FOSSIL FRAGMENTS;
TRACE OF HEAVEY MINERALS

58 - 60 CLAY; LIGHT OLIVE GRAY TO MODERATE OLIVE BROWN; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
OTHER FEATURES: PARTINGS;

60 - 68 CLAY; OLIVE GRAY TO GREENISH GRAY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-04%, IRON STAIN-03%, PHOSPHATIC SAND-01%, SILT-01%;
OTHER FEATURES: PARTINGS;
FOSSILS: FOSSIL FRAGMENTS, SHARKS TEETH;
SAND COMMON ALONG CLAY PARTINGS 5CM PALE GREEN CLAY AT 62 FEET

68 - 69 CLAY; GRAYISH GREEN TO DARK GREENISH GRAY; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: DOLOMITE-35%, QUARTZ SAND-02%, PHOSPHATIC SAND-05%,
PHOSPHATIC GRAVEL-05%;
FOSSILS: FOSSIL MOLDS, SHARKS TEETH;
DOLOMITE / PROSPHATE RUBBLE ZONE;DOLOMITE IS SCOURED BY CLAM AND/OR WORM BORINGS; TOP OF
MARKS HEAD

69 - 71.3 DOLOMITE; WHITE TO VERY LIGHT GRAY; 10% POROSITY, INTERGRANULAR;
50-90% ALTERED;
GRAIN SIZE: MICROCRYSTALLINE; GOOD INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT;
ACCESSORY MINERALS: PHOSPHATIC SAND-05%, QUARTZ SAND-03%, IRON STAIN-10%;
OTHER FEATURES: PARTINGS;
LOCALLY HIGHER PHOSPHATE CONCENTRATIONS ALONG PARTING PLANES

71.3- 72 DOLO-SILT; LIGHT OLIVE GRAY; 15% POROSITY, INTERGRANULAR; MODERATE INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX;
ACCESSORY MINERALS: PHOSPHATIC SAND-08%, QUARTZ SAND-04%;

72 - 73.9 DOLOMITE; VERY LIGHT GRAY TO WHITE; 10% POROSITY, INTERGRANULAR;
50-90% ALTERED;
GRAIN SIZE: MICROCRYSTALLINE; GOOD INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT;
ACCESSORY MINERALS: PHOSPHATIC SAND-03%;
OTHER FEATURES: PARTINGS;
FOSSILS: FOSSIL MOLDS;
PHOSPHATE CONCENTRATION INCREASES TO 10 % ALONG PARTINGS

73.9- 75.5 DOLO-SILT; LIGHT GRAYISH GREEN TO LIGHT GREENISH GRAY; 20% POROSITY, INTERGRANULAR;
MODERATE INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX;
ACCESSORY MINERALS: PHOSPHATIC SAND-03%;
LAMINATIONS AT 75.3 FT.;ZONE GRADES INTO CLAY.

75.5- 77.2 CLAY; LIGHT OLIVE GRAY TO LIGHT GREENISH YELLOW; 7 % POROSITY, MODERATE INDURATION;
CEMENT TYPE(S): CLAY MATRIX;

77.2- 81.1 DOLO-SILT; LIGHT OLIVE GRAY TO LIGHT GRAYISH GREEN; 25% POROSITY, INTERGRANULAR;
MODERATE INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT;
ACCESSORY MINERALS: CLAY-04%, PHOSPHATIC SAND-04%;

81.1- 81.9 CLAY; GRAYISH GREEN TO GRAYISH OLIVE GREEN; POOR INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
ACCESSORY MINERALS: IRON STAIN-05%, PHOSPHATIC GRAVEL-07%;
FOSSILS: FOSSIL FRAGMENTS;
PHOSPHATIC GRAVEL CONCENTRATION RANGES FROM 0 TO 10% LOCALLY.

81.9- 88.9 DOLO-SILT; WHITE TO YELLOWISH GRAY; 25% POROSITY, INTERGRANULAR, MOLDIC, VUGULAR;
GOOD INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT;
ACCESSORY MINERALS: QUARTZ SAND-04%, PHOSPHATIC SAND-08%;
FOSSILS: FOSSIL MOLDS, MOLLUSKS;
INDURATION IS VARIABLE AND MODERATE NEAR BASE OF INTERVAL.

88.9- 94 DOLOMITE; VERY LIGHT GRAY TO LIGHT GRAY; 15% POROSITY, INTERGRANULAR;
90-100% ALTERED; ;
GRAIN SIZE: MICROCRYSTALLINE; GOOD INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT;
ACCESSORY MINERALS: IRON STAIN-20%, PHOSPHATIC GRAVEL-05%, PHOSPHATIC SAND-07%;
OTHER FEATURES: SUCROSIC;
FOSSILS: FOSSIL MOLDS, MOLLUSKS;
TOP OF PENNY FARMS @ 94 FT. RUBBLE ZONE OF BOTH MARKS HEAD AND PENNY FARMS LITHOLOGIES;
REPRESENTS INITIAL PHASE OF MARKS HEAD DEPOSITION; WORM AND/OR CLAM BORINGS COMMON.

94 - 100.8 DOLOMITE; VERY LIGHT GRAY TO WHITE; 05% POROSITY, INTERGRANULAR, MOLDIC, VUGULAR; 90-100% ALTERED; ;
GRAIN SIZE: MICROCRYSTALLINE; GOOD INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT;
ACCESSORY MINERALS: IRON STAIN-01%, PHOSPHATIC SAND-05%, QUARTZ SAND-02%, PYRITE-01%;
FOSSILS: FOSSIL MOLDS, MOLLUSKS;
PHOSPHATE/DOLOMITE RUBBLE ZONE :95.9 - 96.9 FT. WITH BORINGS; BURROW TUNNELS AT 94.5 FT.;INTRACLASTS COMMON ; PHOSCRETE SURFACE MARKS TOP OF INTERVAL.

100.8- 108.5 DOLO-SILT; YELLOWISH GRAY TO VERY LIGHT GRAY; 25% POROSITY, INTERGRANULAR, MOLDIC, VUGULAR; GOOD INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT;
ACCESSORY MINERALS: QUARTZ SAND-20%, PHOSPHATIC SAND-10%;
FOSSILS: SHARKS TEETH, FOSSIL MOLDS;
CHALKY TEXTURE FROM 105 TO 108.5 FT.

108.5- 110.7 DOLO-SILT; VERY LIGHT GRAY TO VERY DARK PURPLE; 51% POROSITY, MOLDIC; GOOD INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT;
ACCESSORY MINERALS: PHOSPHATIC SAND-03%, QUARTZ SAND-04%;
FOSSILS: MOLLUSKS, CORAL, FOSSIL MOLDS;
WORM AND/OR CLAM BORINGS COMMON.

110.7- 111.3 CLAY; MODERATE LIGHT GRAY TO MODERATE DARK GRAY; INTERGRANULAR; MODERATE INDURATION;
CEMENT TYPE(S): CLAY MATRIX, DOLOMITE CEMENT;
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, QUARTZ SAND-02%, IRON STAIN-05%;
OTHER FEATURES: DOLOMITIC;

111.3- 125.9 DOLOMITE; VERY LIGHT GRAY TO LIGHT GRAY; 15% POROSITY, INTERGRANULAR, VUGULAR, MOLDIC; 50-90% ALTERED;
GRAIN SIZE: MICROCRYSTALLINE; GOOD INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT;
ACCESSORY MINERALS: QUARTZ SAND-15%, PHOSPHATIC SAND-02%;
OTHER FEATURES: SUCROSIC;
GREY CLAY : 122.6 - 125 FT.

125.9- 129 CLAY; WHITE TO VERY LIGHT GRAY; INTERGRANULAR; MODERATE INDURATION;
CEMENT TYPE(S): CLAY MATRIX;
OTHER FEATURES: DOLOMITIC;

129 - 159 NO SAMPLES

159 - 162 MUDSTONE; WHITE TO VERY LIGHT GRAY;
GRAIN TYPE: CALCILUTITE;
GRAIN SIZE: MICROCRYSTALLINE; MODERATE INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-03%, PHOSPHATIC SAND-03%;
OTHER FEATURES: LOW RECRYSTALLIZATION, PARTINGS;
FOSSILS: SPICULES;

162 - 162.7 SAND; YELLOWISH GRAY TO LIGHT OLIVE GRAY; 35% POROSITY, INTERGRANULAR;
GRAIN SIZE: COARSE; RANGE: FINE TO VERY COARSE;
ROUNDNESS: SUB-ANGULAR TO ROUNDED; LOW SPHERICITY; POOR INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT;
ACCESSORY MINERALS: HEAVY MINERALS-01%, IRON STAIN-15%, PHOSPHATIC SAND-03%;
ROUNDED PHOSPHATIC CLAY CLASTS COMMON.

162.7- 168.8 DOLOMITE; VERY LIGHT GRAY TO YELLOWISH GRAY; 10% POROSITY, INTERGRANULAR;
GOOD INDURATION;
CEMENT TYPE(S): DOLOMITE CEMENT;
ACCESSORY MINERALS: QUARTZ SAND-45%, PHOSPHATIC SAND-04%, PYRITE-01%;
OTHER FEATURES: SUCROSIC;
DOLOMITIC GREY CLAY INTRACLASTS COMMON.

168.8- 171 CLAY; VERY LIGHT GRAY TO YELLOWISH GRAY; MODERATE INDURATION;
CEMENT TYPE(S): CLAY MATRIX, DOLOMITE CEMENT;
ACCESSORY MINERALS: LIMESTONE-15%;
@ 169.5 FT. 3 IN. WHITE MICRITE ZONE;

171 - 173.7 MUDSTONE; YELLOWISH GRAY TO WHITE; 15% POROSITY, INTERGRANULAR;
GRAIN TYPE: CALCILUTITE;
GRAIN SIZE: MICROCRYSTALLINE; MODERATE INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
ACCESSORY MINERALS: QUARTZ SAND-15%, PHOSPHATIC SAND-03%;
POSSIBLE LIME RUBBLE ZONE AT BASE OF INTERVAL; TOP CRYSTAL RIVER FM. OF THE OCALA GROUP AT 173.7;

173.7- 178 MUDSTONE; VERY LIGHT GRAY TO WHITE; 30% POROSITY, INTERGRANULAR, INTRAGRANULAR;
GRAIN TYPE: CALCILUTITE;
GRAIN SIZE: MICROCRYSTALLINE; GOOD INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;

178 - 182 PACKSTONE; LIGHT OLIVE GRAY TO YELLOWISH GRAY; 15% POROSITY, INTERGRANULAR;
GOOD INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX;
FOSSILS: BRYOZOA, ECHINOID, BENTHIC FORAMINIFERA, CORAL, MOLLUSKS;
OPERCULINOIDES OCALANA COMPOSES MORE THAN 60 % OF THE ROCK AT 178.5 - 178.9 FT;LEPIDOCYCLINA OCALANA; TOP OF WILLISTON AT 182 FT.

182 - 191 PACKSTONE; VERY LIGHT GRAY TO LIGHT OLIVE GRAY; 15% POROSITY, INTERGRANULAR, MOLDIC, VUGULAR;
GRAIN TYPE: SKELETAL, BIOGENIC, PELLET; 85% ALLOCHEMICAL CONSTITUENTS;
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO GRAVEL; GOOD INDURATION;
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT;
FOSSILS: CORAL, ECHINOID, BRYOZOA, MOLLUSKS;
HETEROSTIGINA OCALANA OPERCULINOIDES MOODY BRANCHENSIS 183 - 185 FT. LEPIDOCYCLINA OCALANA PROMINANT AT 188 FT. TO TD. RECRYSTALLIZATION NEAR BASE WITH MORE VUGGY POROSITY;

191 TOTAL DEPTH

Appendix II: Permeamter procedures.

APPENDIX II: FALLING HEAD PERMEABILITY TEST PROCEDURES

* SAMPLE PREPARATION PROCEDURE

1. CUT SAMPLE CORE TUBE CAREFULLY in a miter box.

2. MEASURE LENGTH of cut section and RECORD to nearest millimeter, as L.

3. Either put sample in beaker of water to SATURATE, or hook up to the permeameter to saturate. Saturation on the permeameter is preferable, but time may not allow it. See next section.

* SATURATION PROCEDURE ON PERMEAMETER

1. Perform Steps 1 to 5 and 7, as for Falling Head Test, as below.

2. It is not necessary to record t_0 or h_0.

3. Rapid flow through the chamber, especially with clayey samples, may indicate channeling between core barrel and sample. If this problem is suspected, it may be best to cut a new section from the core.

4. When saturation occurs water will flow from the outlet port. Allow water to flow through the specimen until a constant flow condition is observed, i.e., water steadily drips from the outflow tubing.

5. At this time, close the stopcock on the buret.

6. REFILL burette to 0 ml.

7. The apparatus is now ready to perform a Falling Head Test, as in Step 5, below.

* FALLING HEAD TEST. PERMEAMETER SET UP with saturated samples (see diagram).

1. ASSEMBLE permeameter top and bottom plates, BASE, INPUT HOSE, sample retaining screens, and all GASKETS.

2. POUR WATER in base and fill inlet tubing to top of quick-disconnect fitting on hose. This will ensure that there is not air trapped under the sample or in the hose near the input port. Attach inlet host to burette hose with quick-disconnect fitting.

3. Place screen in rubber gaskets (top & bottom). Place gaskets on sample. Place sample in permeameter frame and center over holes.

4. TIGHTEN WING NUTS <u>CAREFULLY</u>, LOOSELY, and EQUALLY all round. The gaskets will seal with very little pressure- too tight and you will ruin the gaskets.

5. OPEN BURET STOPCOCK and read water level in burette IMMEDIATELY. RECORD this as the initial water level, h_o.

6. RECORD the time as t_o.

7. If the gaskets are leaking, water will seep around the adapters. TIGHTEN stopcock. GENTLY tighten wing nuts, wipe water off permeameter, loosen stopcock, and check again for leaks.

8. REFILL BURETTE. RECORD this new level as h_o. RECORD new time, t_o.

9. Allow 20 - 50 ml of water to flow through the sample before reading h_1 on meter stick.

10. RECORD h_1 and time, t_1.

11. CLOSE stopcock and REFILL burette.

12. CALCULATE the Coefficient of Permeability, K, using:

$$K=2.303al/At(\log_{10}ho/hi)Tc$$

where:
- a = inside area or standpipe (burette), cm^2
- A = cross-sectional area of specimen, cm^2
- L = length of specimen, cm
- t = elapsed time (t_1 - t_o), seconds
- h_o= height of water in standpipe above discharge level at time t_o, cm
- h_1= height of water in standpipe above discharge level at time t_1, cm
- Tc= temperature correction factor for viscosity of water, obtained from Table 1, degrees C.

13. REPEAT permeability test twice more, Steps 5-12, RECORD results, and CALCULATE AVERAGE permeability from the three tests.

Table of Temperature Correction Factors, Tc, for converting coefficients of permeability calculated at water temperatures of 15° to 27° C to coefficients of permeability at water temperature of 15° C.

Water Temp. (°C)	Conversion Factor Tc
15	1.00
16	.98
17	.96
18	.93
19	.91
20	.88
21	.87
22	.85
23	.83
24	.81
25	.80
26	.78
27	.76